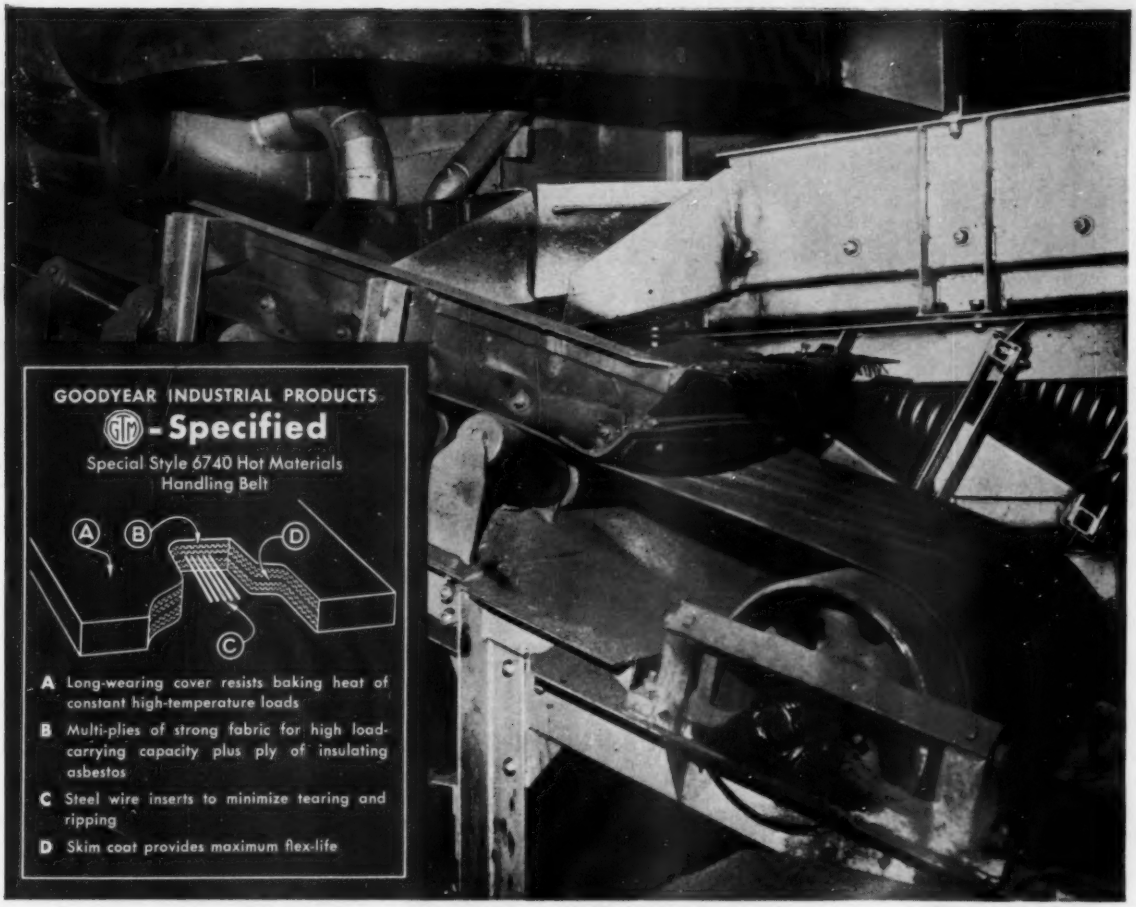
GOODYEAR INDUSTRIAL PRODUCTS
G T M - Specified
Special Style 6740 Hot Materials Handling Belt
A
B
C
D
A Long-wearing cover resists baking heat of constant high-temperature loads
B Multi-plies of strong fabric for high load-carrying capacity plus ply of insulating asbestos
C Steel wire inserts to minimize tearing and ripping
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G.T.M. Saves $4000/year on shake-out refuse belts

SHARP, hot shot, gates, risers and other scrap quickly tore and burned up refuse-handling belts at this automotive foundry. On the average, the 126′ belts only lasted two months. Usually large patches had to be put in the belt to get even two months' service.

Special, wire-inserted belts (see blueprint) and vulcanized, rather than steel-plate, splices were suggested by the G.T.M.—Goodyear Technical Man. Result: *Service averages six months with $4000 annual savings.*

Your belt or other industrial rubber problems may be similarly solved by the G.T.M. and your Goodyear Distributor. Call them, today! Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

STYLE 6740 CONVEYOR BELTS by

GOODYEAR

THE GREATEST NAME IN RUBBER

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

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NEW YORK: Richard Y. Fuller
1613 Graybar Bldg., New York 17, N. Y.
Phone: Murray Hill 5-3779

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Awards for Ideas on Welding

CASH AWARDS for ideas or suggestions that will accelerate progress in arc welding are being offered by The James F. Lincoln Arc Welding Foundation.

Residents of the United States or its possessions are invited to submit ideas to the Foundation on any aspect of arc welding that can be used to advance welded design, welding engineering or the general application of the arc welding process. No restrictions are placed on either the nature or the extent of ideas that may be submitted for awards.

Cash prizes will be distributed in 20 awards with a top award of $5,000, others of 4, 3, 2 and 1 thousand dollars and additional smaller awards.

Ideas must be submitted by July 30, 1956.

Complete information and rules are available from The James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio.

Safety Code for Elevators

IN THE FIFTH revision of the American Standard Safety Code for Elevators, Escalators and Dumbwaiters, several new code rulings have been included.

Some of the items covered in this new edition are: Working platforms on tops of cars are prohibited by the new code. The code says "no" also to ventilating fans mounted inside the elevator car on brackets; to apparatus and equipment inside the car which is not used in its operations; and to all rope, rod, wheel, crank or lever-operating devices. It also prohibits the use of rail lubricants which will reduce the holding power of car safety devices. Repair of damaged parts, necessary to support the installation, and which are under tension or other stresses, may not be done by welding.

One of the most important sections in the code, on alterations, repair and replacements of existing equipment, is entirely new. The code lists 22 alterations defined as those of major importance, and specifies which rules must be applied to each alteration as it is made.

Inquiries about this fifth edition of the code should be addressed to American Standards Association, Inc., 70 East Forty-Fifth Street, New York 17, N. Y.

Get Your Spray Gun Ready

SCHOOL TIME is here again for those readers interested in a review of spray finishing techniques. The DeVilbiss Co. will be conducting another Spray Painting Course at its main plant in Toledo. This is the thirtieth year that the company has arranged these one-week courses.

Topmost on the curriculum is a full explanation and operation of the hot spray process of applying materials. Paint heating equipment and full facilities for each student to apply finishes by the hot spray method will be provided.

Dates for the forthcoming courses of instruction in industrial spray finishing are: March 5, April 23, May 21 and June 11.

Applications may be obtained by writing the DeVilbiss Co., 300 Phillips Ave., Toledo 1, Ohio.

New Plant Engineer for Durez

George E. Patterson was recently appointed plant engineer of the North Tonawanda plant of the Durez Plastics Division of Hooker Electrochemical Co., Niagara Falls, N. Y. He will be in charge of all maintenance and basic service facilities as well as minor project work.

Mr. Patterson's home town is Yonkers, N. Y. He attended Cornell University, where he graduated in 1937 with a degree of mechanical engineer. He was later employed by the Semet-Solvay Div., Allied Chemical and Dye Corp., in their Buffalo plant and in Detroit where he became plant engineer. In 1944, he transferred to Sharples Chemicals, Inc., Wyandotte, Mich., leaving in 1946 to join the North Tonawanda staff of Durez Plastics and Chemicals, Inc.

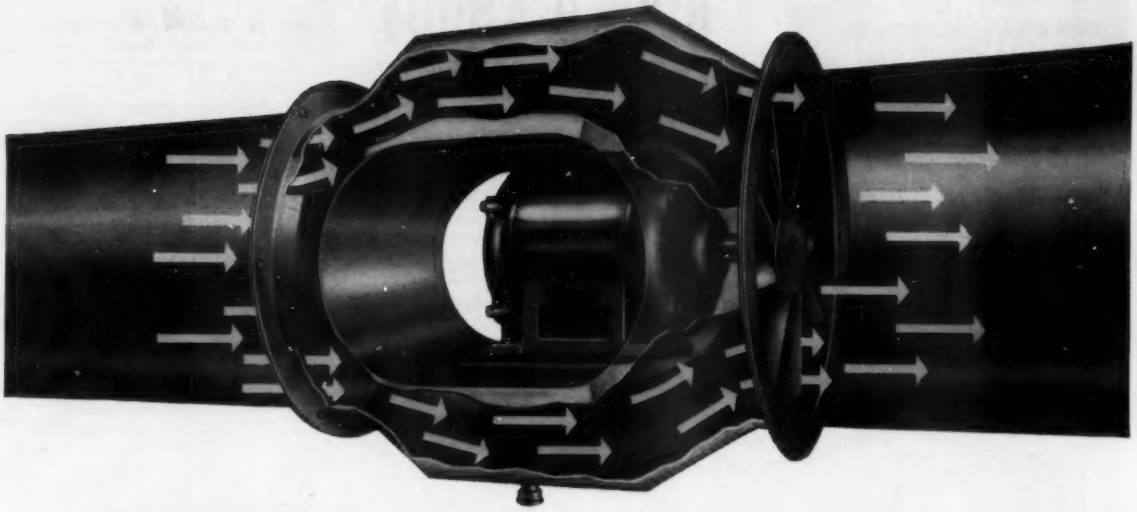
Guide on Coating Ferrous Metals

PERSONNEL ENGAGED in the application of protective phosphate coatings on ferrous metals will be interested in a recent report released to industry.

This report describes the mechanical equipment and its installation, cleaning operations, processing solutions and procedures, and the chemical control methods required for the application of these protective black finishes to ordnance materials.

A study of methods indicated that the degreaser plus a four-tank phosphating unit is entirely satisfactory and represents the most simple, complete system possible. Cleaning methods other than trichlorethylene vapor degreasing may be used but require additional equipment and may introduce troublesome effects on the subsequent formation of phosphate

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of Address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.



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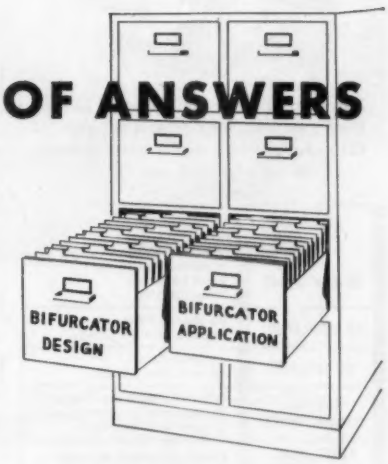
Got a fume problem?

WE'VE A 30-YEAR FILE OF ANSWERS



When you specify a Bifurcator®, you get 30 years experience, from two sources. Not only the experience it takes to *design* top efficiency into a split housing fan . . . but the experience it takes to properly *apply* this fan to your specific fume problem. Production tooling assures accurate reproduction of wind-tunnel tested Bifurcator units. That's why DeBothezat Bifurcator Fan performance always proves your judgment was right — for insisting on a DeBothezat Bifurcator. Send for free Catalog DB-37-55.

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A DIVISION OF

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EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION, DEPT. PE-356
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East Moline, Illinois

☐ Send Bulletin DB-37-55 containing complete data on the Bifurcator for exhausting fumes.

☐ Have a DeBothezat representative call.

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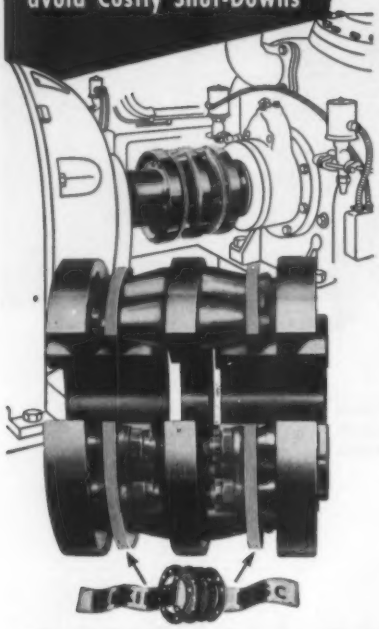
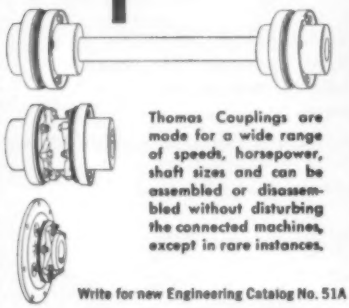
Specify THOMAS ALL METAL
FLEXIBLE COUPLINGS
for Power Transmission to avoid Costly Shut-Downs



Patented Flexible Disc Rings of special steel transmit the power and provide for parallel and angular misalignment as well as free end float.

DISTINCTIVE ADVANTAGES

FACTS	EXPLANATION
NO MAINTENANCE	Requires No Attention. Visual Inspection While Operating.
NO LUBRICATION	No Wearing Parts. Freedom from Shut-downs.
NO BACKLASH	No Loose Parts. All Parts Solidly Bolted.
CAN NOT "CREATE" THRUST	Free End Float under Load and Misalignment. No Rubbing Action to cause Axial Movement.
PERMANENT TORSIONAL CHARACTERISTICS	Drives Like a Solid Coupling. Elastic Constant Does Not Change. Original Balance is Maintained.



Thomas Couplings are made for a wide range of speeds, horsepower, shaft sizes and can be assembled or disassembled without disturbing the connected machines, except in rare instances.

Write for new Engineering Catalog No. 51A

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

coatings. The report also includes a list of the chemicals and materials required for proper maintenance and operation of a phosphating system, and details of a phosphating unit are illustrated.

This 88-page report, PB 111726, Phosphating Materials and Process, Rock Island Arsenal Laboratory, May 1954, is available from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., price $2.25.

On Handling "Hot" Materials

AN INFORMATIONAL text applying to recommended fire safe practice for industries handling radioactive materials has just been published by the National Fire Protection Association.

The booklet is identified as NFPA publication No. 801, "Recommended Safe Practice for Laboratories Handling Radioactive Materials." This 41-page pamphlet is available from the National Fire Protection Association, 60 Batterymarch St., Boston, Mass., at 50 cents per copy.

Promotions at Cornell

Arthur J. Bossert was promoted to the newly created position of assistant plant engineer in the Plant Engineering and Maintenance Department of Cornell Aeronautical Laboratory, Inc., of Cornell University, Buffalo, N. Y. His previous position was that of Head, Engineering Section, of the same department. Bossert joined the Laboratory in 1946 as a junior electrical engineer in the Wind Tunnel Department.

James H. Finley was promoted to the position of Head, Engineering Section, Plant Engineering and Maintenance Department from that of associate mechanical engineer in the same department. Finley joined the Laboratory in June, 1954, as an assistant mechanical engineer.

Material Handling—Western Style

SHINE UP your spurs for the Western Material Handling Conference and Equipment Show, to be held on May 9, 10 and 11, at the Western Livestock Exhibition Auditorium, Los Angeles.

The technical conference will feature talks by material handling engineers, automation experts and technicians from leading California universities. Subjects scheduled for discussion are: automation for high and low production industries; conveyors for plant and long distance hauling; warehousing problems; radio and electronic scheduling and dispatching; leasing of tools and equipment; mass movement of people; and many other subjects concerned with material handling.

As an added attraction, a number of "Fork Truck Cowboys" will be on hand to compete for fame and fortune at an exciting Fork Truck Rodeo, to be held on grounds of Livestock Auditorium.

Index of 1955 Articles

IF YOU WOULD like a copy of the index of articles which appeared in the 1955 issue of PLANT ENGINEERING, kindly indicate "1955 Index" on one of the postage-paid cards appearing in this issue.

Business Magazine Editors Hear Atomic Propulsion Expert

Rear Admiral Hyman G. Rickover, well-known authority on atomic propulsion, was featured speaker at recent meeting of Society of Business Magazine Editors. In group pictured, he discusses talk with, l to r, Oscar W. Graveley, Director of Maintenance, Department of Defense; Colin Carmichael, Machine Design magazine; RADM Rickover; Richard H. Morris, Plant Engineering magazine, and President of SBME; Capt. E. J. Peltier, CEC, USN, Bureau of Yards and Docks

Now quick, positive control circuit identification

Get these 5 specific advantages when you use Rome Control Cables with surface printed color-coding . . .

1. Easy, sure identification of control circuits, even when light is poor or handling has dirtied coverings.
2. The superior aging and physical properties inherent in all-black sheaths and insulations.
3. Color-code printing on *both sides of every conductor at intervals of 1½ inches or less.*
4. Permanently clear white lettering over black conductors, for maximum legibility.
5. Six primary printed color designations with additional tracer combinations for cables of more than six conductors.

Rome Control Cables are offered in three basic types:

RoZone® insulated—RoPrene sheathed—Type CRO-1 • The ultimate in control cable design and performance. Conductors are insulated with RoZone, a high-quality oil-base compound, and individually sheathed with RoPrene (Neoprene). RoPrene sheath provides over-all protection.

RoMarine insulated—RoPrene sheathed—Type CRM-1 • A moderately priced, high-quality, general-purpose design. Individual conductors are insulated with heat- and moisture-resistant compound, with an over-all sheath of RoPrene (Neoprene).

Rome Synthinol® insulated—Rome Synthinol or RoLene sheathed—Type CT-2 • A quality thermoplastic construction with Synthinol insulation protected by a Rome Synthinol (polyvinyl chloride) or RoLene sheath. A small diameter, moderate cost control cable.

Application engineering, detailed specifications or more complete information on printed color-coding are yours for the asking. Write today.

It Costs Less to Buy the Best

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Please send me the Platecoil story.

My problem is _____

_____

Name _____

Company _____ Title _____

Address _____

City _____ State _____

TRANTER PLATECOILS®

SPEED PRODUCTION CUT OPERATING COSTS SAVE HOURS DOWNTIME

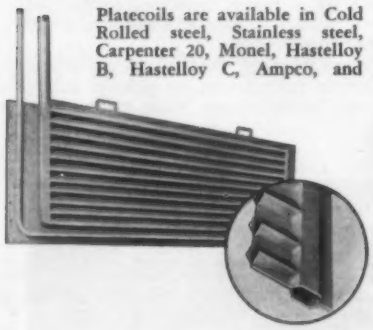
Long hours spent waiting for tanks to heat or cool are not productive, nor are the hours spent in waiting for pipe coil repairs. Fill each day with more productive hours by using Tranter Platecoil heat transfer units. The greater prime surface of these units provides faster cooling or heating and adds productive hours. Installed on simple, quick-change hangers, Platecoils can be removed and replaced quickly without the use of a hoist or other machinery — saving maintenance hours and dollars.

Tranter Platecoils save in other ways too. Their initial cost is as much as 50% lower than equivalent pipe coil, depending upon the materials use in construction. Valuable tank space is saved as Platecoils take only half the space of pipe coils. They don't require cleaning nearly as often and take for less time to clean.

Available in standard sizes, Platecoils give dependable, standardized performance so that you can count on making more hours fully productive.

NOW AVAILABLE IN THESE METALS

Platecoils are available in Cold Rolled steel, Stainless steel, Carpenter 20, Monel, Hastelloy B, Hastelloy C, Ampco, and Nickel. Cold Rolled steel and Stainless steel Platecoils are maintained in stock for fast delivery.



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DIVISION

TRANTER MANUFACTURING, inc.

780 E. Hazel St., Lansing 4, Michigan

BLENDING TIME REDUCED AT PROTECTION PRODUCTS

4 to 6 HOURS SAVED IN HEAT UP TIME

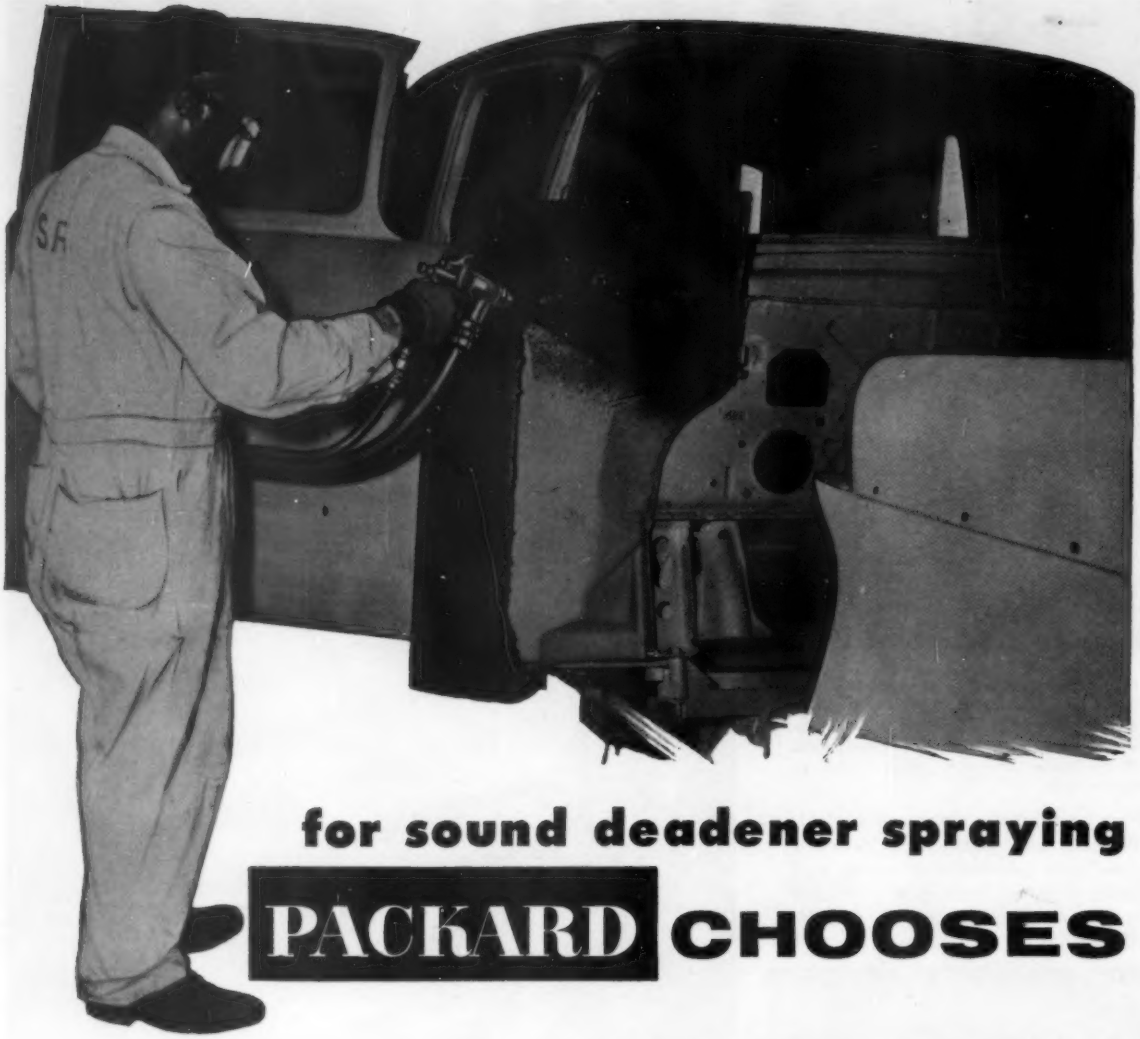
Faster, more uniform heat transfer has been experienced with Platecoils in blending components of chemical preservatives. To provide ease of installation, these Tranter Platecoils were rolled to fit the tank.

Platecoils heat 1,800 gallons of water from room temperature to boiling in 2 hours at Athens Stove Works, saving 4 to 6 hours. Maintenance costs were reduced 25%.

NO MAINTENANCE IN OVER A YEAR

The "shocking" action of this electropolished Stainless Steel Platecoil in a Parker Lubrite tank at Lycoming-Spencer Division of Avco Corporation kept it in operation without cleaning for more than a year. Previously, cleaning of heating equipment was required at least once a month — sometimes every few days.

For more facts circle 506 on Reply Card



for sound deadener spraying

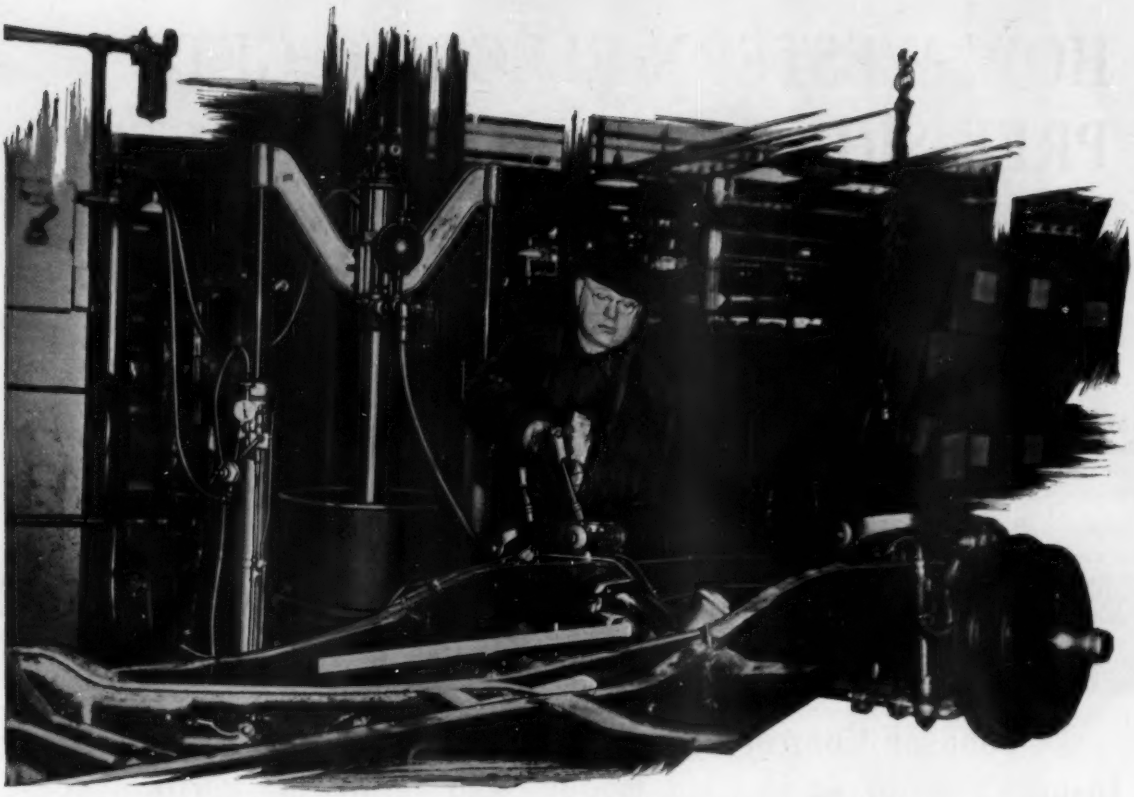
PACKARD CHOOSES

In equipping Packard's outstandingly modern new plant, Lincoln equipment scored a double "first choice." For fast and efficient lubrication of torque converter chassis, Packard chose a Lincoln Lubricant Application system. For easy, efficient sound deadener coating, Packard chose a modern Lincoln Materials Dispensing system.

In plants everywhere, Lincoln equipment is making possible new savings in the handling and application of sealing and sound deadening materials. Even the most difficult compounds are easily

Lincoln

LINCOLN ENGINEERING COMPANY
5702-26 Natural Bridge Avenue • St. Louis 20, Missouri

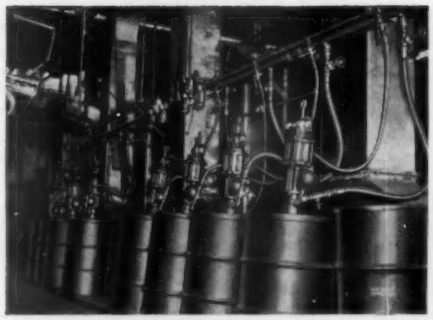


...for production line lubrication

Lincoln EQUIPMENT

controlled by means of Lincoln's exclusive *Pressure-Flow Equalizer.**

Lincoln's Balanced Power design prevents surges or blobs of material when the control valve is opened. The pumps are remote-controlled *automatically* from the spray head. When the operator opens the valve, the pump instantly delivers material at even pressure and constant flow. When the spray head is closed, the pump stops automatically, avoiding unnecessary operation and pressure build-up in the line. Pre-agitation of the material being applied is possible to assure uniform mixture and texture.



Lincoln Heavy Duty Balanced Power Pumps supplying multiple outlets on Packard assembly lines.

For All the Facts... call your nearby Lincoln Distributor. You'll find him listed in the classified section of your phone book. Or *Write Us*... for your Free copies of Catalog No. 41 (Materials Dispensing Equipment) or Catalog No. 80 (Lubricant Application Equipment).

*Trade Name Registered

THE MOST TRUSTWORTHY NAME IN LUBRICATING EQUIPMENT

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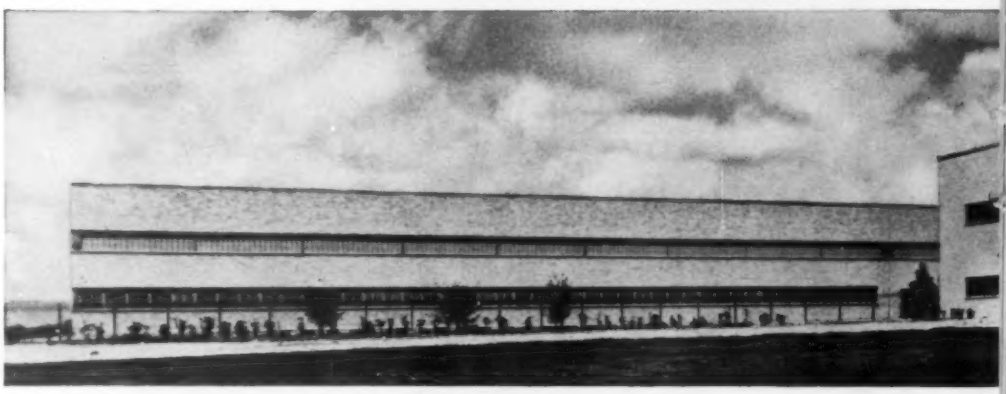
HOW WESTERN ELECTRIC GETS PRECISION TEMPERATURE CONTROL FOR ONE ROOM–or ACRES OF ROOM!



New 625,000 sq. ft. Lexington Road Plant of Western Electric Company, Inc., Winston-Salem, N. C.

Western Electric Company, Inc., and Walter Kidde Constructors, architects and engineers, New York; Rowe-Goodin-Jones, Inc., and Piedmont Air Conditioners, Inc., mechanical contractors, both of Durham, N. C.

Johnson Control System Meets Varied Control Needs, Insures Waste-Free Heating, Cooling and Ventilating Performance.

At Western Electric's new Lexington Road Plant, automatic temperature control is a major consideration. The comfort and efficiency of 4,000 employees are directly involved. So are sensitive processing operations. And, in a building this size, the potential savings in heating, cooling and ventilating costs are tremendous.

To satisfy each of these important requirements, Johnson furnished and installed a complete system of automatic temperature and air conditioning control.

MANUFACTURING BUILDING

Actually, the plant consists of two separate structures—a manufacturing building and an office building. The main floor manufacturing area, 620 by 280 feet, is surrounded by an 80-foot periphery partitioned for offices, special process rooms, laboratories, employees' club, cafeteria and locker rooms.

In the general manufacturing area, Johnson Thermostats, Valves, Dampers and related apparatus accurately regulate the operation of 13 large central heating and ventilating systems. Other units serving a partial lower floor are also controlled.

Special process rooms and laboratories are air conditioned. Here the Johnson System rigidly maintains uniform protective temperatures and humidities to safeguard sensitive products and processes.

Office spaces, the cafeteria and employees' club are air conditioned and controlled at ideal comfort levels.

OFFICE BUILDING

The 444-ft. by 103-ft. two-story office building is completely air conditioned. Johnson Air Conditioning Control regulates 12 central air handling units that supply perfectly conditioned air for private offices as well as general offices. Strategically located Johnson Thermostats insure constant comfort, regardless of outdoor conditions, occupancy levels or the heat-producing effects of lighting and office machines.

OPERATING ECONOMIES

Throughout both buildings, Johnson Control produces exactly the desired conditions at a substantial saving in operating costs. The entire installation, like every Johnson System, was engineered to fit the specific control requirements of the plant's particular mechanical equipment. The result is virtually waste-free operation of heating, cooling and ventilating equipment.

In addition, the simplicity and rugged construction of Johnson pneumatic apparatus insure long, trouble-free performance with minimum upkeep.

The techniques and engineering skill applied by Johnson to this modern plant, *and countless other buildings of all types and sizes*, can also be applied to your control problems. Talk to a Johnson engineer soon. His recommendations are yours without obligation.

JOHNSON CONTROL

SINCE 1885

PLANNING • MANUFACTURING • INSTALLING

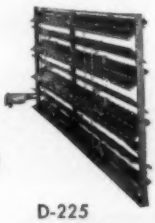
R-1051 Static Pressure Indicator-Controller

T-800 Remote Bulb Thermostat

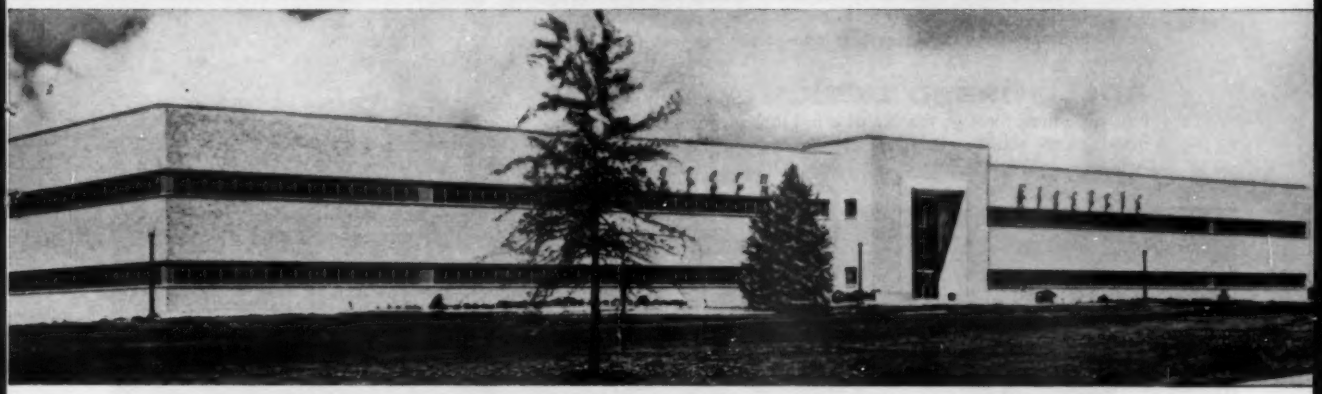
T-400 Room Thermostat

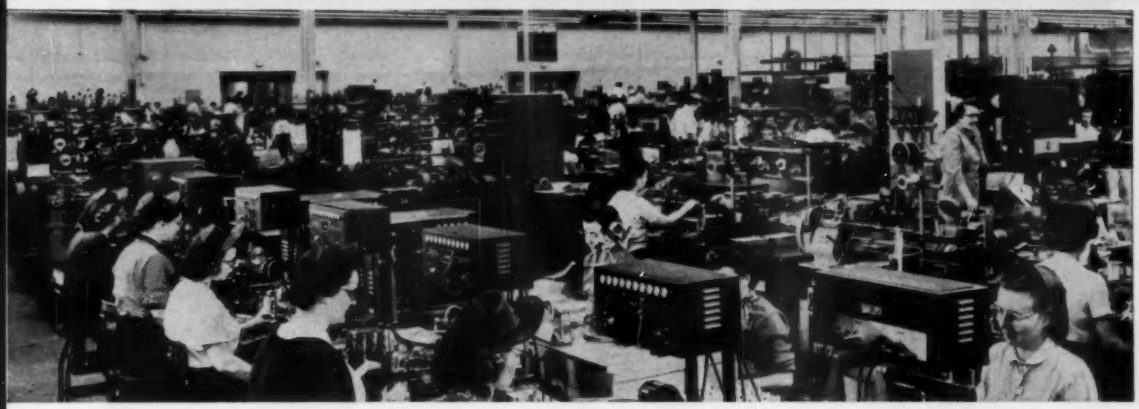
V-108 Three-Way Mixing Valve

T-432 Heating-Cooling Thermostat



D-225 Louver Damper





Let JOHNSON SOLVE YOUR CONTROL PROBLEMS

PROCESSING • HEATING • COOLING • HUMIDIFYING
DEHUMIDIFYING • VENTILATING • AIR CONDITIONING

PROCESS CONTROL

Automatic temperature and humidity control for a wide range of manufacturing and industrial process applications. Thermostats, special controllers, valves and dampers applied to tanks, dryers, vats, kettles, curing rooms, coolers, kilns, ovens and other processing equipment.

SPACE CONTROL

Automatic control of room temperature and humidities applied to radiators, radiant heating, unit ventilators, unit heaters and heat delivery ducts. Johnson equipment includes a complete line of thermostats, thermometers, pressure regulators, humidostats, humidifiers, valves, dampers, damper operators, switches, special controllers and related apparatus.

Complete sales, engineering, installation and service facilities are available through 98 direct branch offices in the United States and Canada.

T-1000
Recorder-Controller

V-153 Sylphon
Diaphragm Valve

D-251 Piston
Damper Operator

JOHNSON SERVICE COMPANY

507-R East Michigan St., Milwaukee 1, Wisc.

☐ Please have a Johnson engineer call on me.
☐ Send your Condensed Catalog of Johnson equipment.

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FIRM _____

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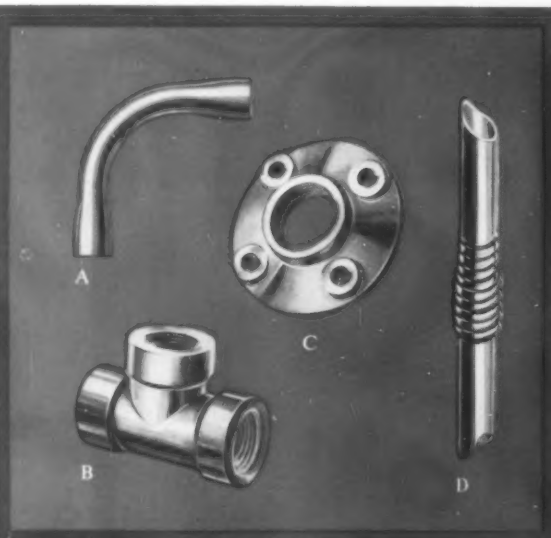
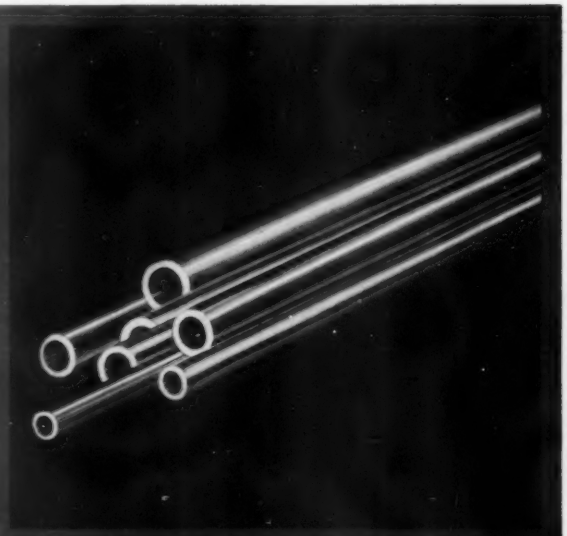
ONE MATERIAL...

EXCLUSIVE WITH BOLTARON TWO NEW CONCEPTS IN FITTINGS AND DESIGN!

SHRINK FITTINGS Specially designed PVC fittings that, when heated, shrink to form an air-tight, leak proof, permanent mechanical bond insuring a non-corrosive, free-flow piping system.

ROLL-THREAD DESIGN Specially engineered PVC pipe that, through the use of a roll thread, forms a mechanical bond better than conventional threading for larger sized pipe. Available in 3", 4", and 6" diameters. Quick and easy installation.





FITTINGS

Boltaron offers you the only complete line of PVC fittings in a full variety of sizes. The line includes ells, tees, plugs, caps, couplings, bushings, unions, flanges and expansion joints in standard pipe threads and, in most cases, the new shrink fitting and roll-thread design. All molded standard threaded fittings are produced by Stokes Molded Products.

All Boltaron fittings are made of Boltaron 6200 unplasticized PVC and are manufactured under rigid inspection standards. This assures you of uniformity of quality and maintenance-free, corrosion-free action in your PVC installations.

A. Shrink-fitting ell *
B. Threaded tee
C. Standard flange
D. Roll-thread pipe

* Patent applied for

PIPE

A complete line of PVC pipe from ¼" through 6" in Schedules 40 and 80. Only one-sixth the weight of steel, Boltaron 6200 pipe offers easy handling and quick installation.

Like other Boltaron 6200 PVC products, it has outstanding resistance to corrosive gases and liquids, treated and untreated waters, alcohols, alkalies and acids; it's a non-conductor, thus eliminating electrolysis problems. It's abrasion-resistant. Boltaron PVC pipe virtually eliminates maintenance.

TECHNICAL SERVICE: Our highly trained staff and that of our distributors and fabricators are located throughout the country to give you expert advice and service. They will advise you on the complete Boltaron 6200 unplasticized PVC line at no obligation.

TRAINING SCHOOL: The Plastic Fabricating Institute, located in Lawrence, Mass. and organized by H. N. Hartwell and Bolta Products is available to your personnel. Training is given to fabricators, distributors, piping contractors and industry in the application, fabrication, welding and forming of Boltaron 6200 unplasticized PVC.

ONE SOURCE...ONE QUALITY

Boltaron 6200

Registered Trademark, The General Tire & Rubber Co., Akron, Ohio

unplasticized PVC (type I)

THE ANSWER TO YOUR CORROSION PROBLEMS

VALVES

Boltaron PVC valves, engineered by Lunkenheimer. are the first all-molded unplasticized PVC valves designed and engineered by a valve manufacturer. Boltaron valves are available in ½" through 2" sizes. Component parts are made of Boltaron 6200 PVC. insuring complete corrosion-free service.

Boltaron 6200 is odorless, tasteless and resistant to industrial chemicals. Weighs only ½ as much as aluminum and can be molded to precise tolerances.

CUSTOM APPLICATIONS

Boltaron 6200 unplasticized PVC is available in corrosion-resistant pipe, rod, sheet and block form. Its handling versatility is unique. To fit your particular needs, Boltaron can be stamped, sheared, sawed, ground, turned and milled; it can be planed, drilled, embossed, drawn, molded, rolled, bent, heat or solvent welded. Whatever your needs — an exhaust system, acid piping or machined parts — Boltaron meets your specifications.

Our expert force of consulting engineers is at your service. Contact us — there's no obligation.

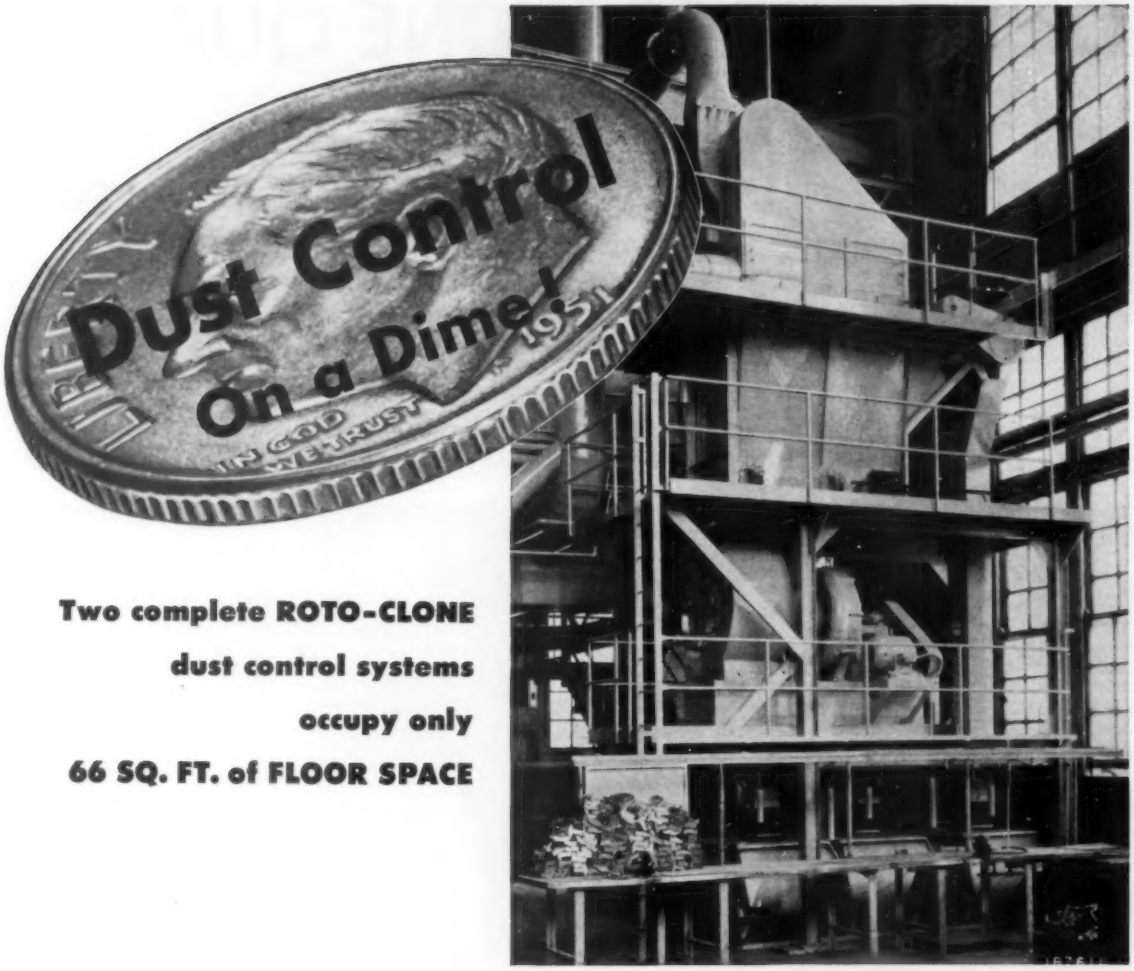
Some territories still available for fabricators and distributors

H. N. HARTWELL & SON, INC.

Industrial Plastics Division, **Park Square Bldg., Box 301, Boston 16, Massachusetts**

The only integrated source for Unplasticized PVC Materials

For more facts circle 510 on Reply Card



Two complete ROTO-CLONE dust control systems occupy only 66 SQ. FT. of FLOOR SPACE

LACK of room is no alibi for not providing efficient dust control. Here's a dual ROTO-CLONE* installation in a large foundry which occupies only 66 sq. ft. of floor space. A Type D of 4500 cfm capacity, located on lower platform, collects snag grinder dust. At top, a Type N of 6000 cfm capacity exhausts abrasive cleaning equipment. Dust and sludge from the two units are discharged through chutes into covered tote boxes at bottom for later disposal.

Every dust collector in AAF's complete line is a space saver. And, with all this compactness, every unit is a high efficiency collector designed for constant exhaust volume and maintained performance over a wide range of operating conditions.

Remember—there is always room for modern dust control. The right equipment coupled with creative engineering thinking is certain to come up with a practical, economical solution. AAF has both. We'd like to prove it in your plant.

**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*

AAF herman nelson

American Air Filter
COMPANY, INC.
228 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

Air Filters and Precipitators

Illinois Steam Heating Specialties

— BETTER AIR IS OUR BUSINESS —

Herman Nelson Unit Heaters

Herman Nelson Portable Heaters

For more facts circle 511 on Reply Card

NEW LIGHTWEIGHT YALE HAND PALLET TRUCK

★ **Less operator effort**

New Yale Model A Hydraulic Hand Lift Pallet Truck is lighter than any other hand truck with a capacity of 2000 lbs. Weighs only 200 lbs., resulting in less pulling effort by the operator—less operator fatigue.

★ **Smoother lifting and lowering of forks**

Operator can lift heavy loads 4 inches with 9 easy foot pedal strokes. Controlled lowering gives cushion action to protect fragile loads from handling shocks.

★ **Easier to maneuver when loaded**

Lightweight construction of Yale's new Hand Pallet Truck makes maneuvering easier even when truck is fully loaded because there's less deadweight to pull or push. Dual articulated steering wheels provide ease of steering and maximum stability over rough surfaces.

★ **More grade clearance**

Compression tubes, used for lifting, are mounted high in the forks and allow 50% more underclearance than other hand trucks.

SPECIFICATIONS:

- **Capacity: Hydraulic Lift up to 2000 lbs.**
- **Weight with 48" forks: 200 lbs.**
- **Ground clearance: Lowered—1⅜"; Raised—5⅜".**
- **Handle: Balanced Spring Type.**
- **Fork Lengths: 30" to 72" in 6" increments.**
- **Bearings: Front wheels—Tapered Roller Bearings; Rear wheels—Ball Bearings**

Low Cost... Find out more about the new Yale Model A Pallet Truck—the lightest hand truck of its type ever built. Its low initial cost writes itself off fast in daily handling savings. For complete information, write Yale & Towne Mfg. Co., Philadelphia 15, Pa., Dept. 473.

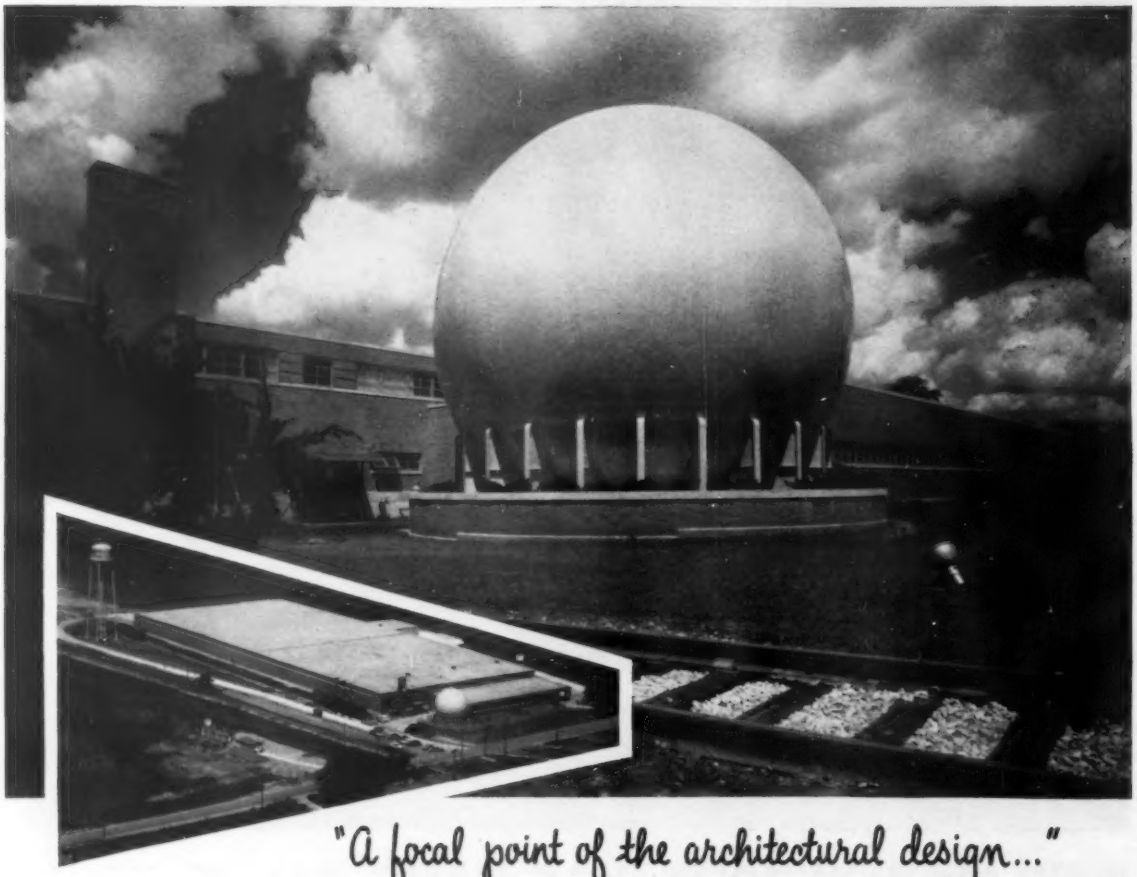
YALE* **INDUSTRIAL LIFT TRUCKS AND HOISTS**

*REG. U.S. PAT. OFF.

Gas, Electric, Diesel & LP-Gas Industrial Trucks • *Worksavers* • Warehousers • Hand Trucks • Hand and Electric Hoists

For more facts circle 512 on Reply Card

200,000-gal. Horton Spherical Water Storage Tank



"A focal point of the architectural design..."

at Waxdale

• A 200,000-gal. Horton® spherical water storage tank, used to supply the plant sprinkler system, was chosen for Waxdale, Johnson Wax, Inc. Shipping Center at Sturtevant, Wisc. According to J. P. Halama, Johnson's Staff Architect, "We decided to make the reservoir a focal point of the architectural design and therefore, chose a sphere because of its aesthetic value." In addition, a 100,000-gal. Horton elevated tank was also installed to provide dependable *gravity* pressure water supply.

CB&I has complete facilities to design, fabricate and erect steel plate structures of standard or unique design. Write our nearest office for further information.

CB&I

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
Los Angeles • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

Get ENGINEERED felt from American

YOU'LL LIKE IT, AS DOES Whirlpool

STATEMENT BY Whirlpool

"Whirlpool Corporation has used felt products for some time. At present they are used on our new high-speed dryer as well as our conventional dryer. Felt is satisfactory as to pressure or vacuum, and it is giving satisfactory service as to temperature resistance.

"The particular type of felt which we are buying is much more satisfactory than anything previously used, including other materials. This is because of the resiliency of the material, which is designed inherently to flex back into its original position."

American supplies Whirlpool Corporation, St. Joseph, Mich., with felt for its dryers. The Imperial model shown here uses plain felt as a seal at the loading port. At the exhaust, where the air is hot and full of moisture, the felt is blended with Hycar, which provides moisture resistance. The dryer drum rotates at 45 r.p.m., and the felt seals effectively keep heated air and moisture out of the cabinet, and heated air in the drum at somewhat less than atmospheric pressure during operation. The seals are supplied as sewn rings, ready for fast, economical installation.

This is an outstanding example of thorough engineering applied to an application of felt. American will be glad to collaborate with you on the use of felt on your present or proposed products.

American Felt Company
TRADE MARK ®

GENERAL OFFICES: 80 GLENVILLE ROAD, GLENVILLE, CONN.

SALES OFFICES: New York, Boston, Chicago, Detroit, Cleveland, Rochester, Philadelphia, St. Louis, Atlanta, Dallas, San Francisco, Los Angeles, San Diego, Portland, Seattle, Montreal.—PLANTS: Glenville, Conn.; Franklin, Mass.; Newburgh, N. Y.; Detroit, Mich.; Westerly, R. I.—ENGINEERING AND RESEARCH LABORATORIES: Glenville, Conn.

For more facts circle 514 on Reply Card

Setol Cleanser HAS WHAT IT TAKES TO MACHINE-SCRUB OILY FLOORS—

Faster cleaning action!

Cuts operating time of the scrubbing machine

Because *Setol* is specially compounded for the greater speed of *combination-machine-scrubbing*, it must *and does* work faster than average alkaline cleansers. *Setol* saponifies *and emulsifies* grimy oil and grease *instantaneously*. The wetting agent in *Setol floats the oil* for fast, easy, *and thorough* removal by the vac of a *combination machine* or with a separate vac unit. And because *Setol* stays fast-acting longer—does not spend its strength quickly as do ordinary oil and grease solvents—less is required to clean a given area. Thus *Setol* saves on materials and, by speeding the cleaning process, cuts operating time of the scrubbing machine . . . reduces labor costs . . . and saves on brushes. Best of all, *Setol gets floors oil-free clean!* Also acts as a disinfectant (contains pine oil), and leaves a pleasant, clean aroma.

- **A constant, fast-acting cleanser for machine-scrubbing cement, wood, wood block, metal, stone, and terrazzo floors**
- **Consistent use on cement floors prevents cement dusting . . . provides a finish that helps seal out waste materials**

Finnell 213P Scrubber-Vac

Applies cleanser, scrubs, and picks up — in ONE operation!

For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 5303 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

FINNELL SYSTEM, INC.

Originators of Power Scrubbing and Polishing Machines

Everything FINNELL for Floor Care

BRANCHES IN ALL PRINCIPAL CITIES

For more facts circle 515 on Reply Card

When you want the best in unit heating...

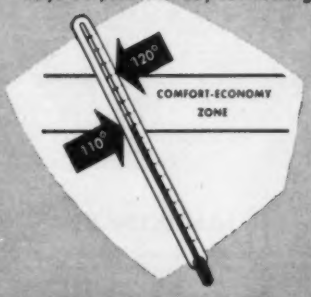
Look for the name MODINE

Like so many well-known, pioneer names . . . Frigidaire, Victrola, Kodak . . . "Modine" is commonly used as a descriptive word to identify all makes of steam and hot water unit heaters. But — if it doesn't carry the MODINE nameplate, *it is not a* Modine Unit Heater.

Only unit heaters designed and built by Modine give you all the performance and operating advantages which have made Modine the first name in unit heating for over a quarter century. And continuing research and development are your assurance that Modines will always be your best buy for heating comfort and economy.

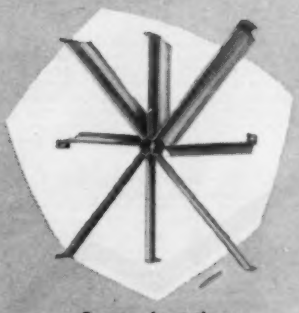
A model for every need

Modine horizontal delivery models for steam and hot water are built in two distinct types (blow-through and draw-through) and 36 different capacities. A unit for every application.



More comfort per fuel dollar

Discharge air temperatures of 110° to 120°F are correctly related to air velocities, assuring perfect heating comfort plus lower fuel costs.



Greater heat throw

No one but Modine provides a built-in velocity generator that effectively steps up heat throw . . . assures positive heat penetration of cold air strata near floor.

Sturdy built-in fan guard

Safety fan guard of steel rod stock offers constant protection. Also serves as resilient motor mount, absorbing and dissipating fan vibration.

Modine Vertical Unit Heaters are offered in 26 different models, each with choice of 4 types of air deflectors. New light weight cuts installation costs.

Want the complete story?

For details on why Modine offers you the best in unit heating . . . more value, less trouble — contact the representative listed in your classified phone book. Or, ask for Catalog 155. Write to Modine Mfg. Co., 1563 DeKoven Ave., Racine, Wisconsin.

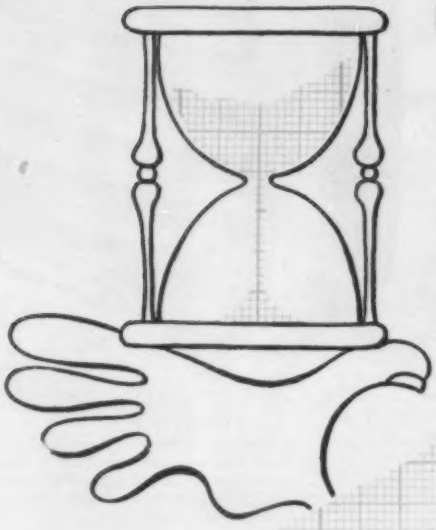
Modine UNIT HEATERS

SU-1286

For more facts circle 516 on Reply Card

time to trim

maintenance costs



In setting up your program to combat high costs during 1956, perhaps maintenance expense offers an opportunity for important dollar savings. It's a controllable expense—and one that can often be sharply reduced through improved lubrication.

If your lubrication practice is not as up to date as your equipment and processes, we suggest that you talk to a Gulf Sales Engineer. He will make some worth-while suggestions that will help you reduce costs and improve the performance of your production facilities.

GULF

GULF OIL CORPORATION · GULF REFINING COMPANY

1822 Gulf Building, Pittsburgh 30, Pa.

For more facts circle 517 on Reply Card

BULLETINS just released and of immediate plant interest

INSTRUMENTS, CONTROLS

101 **Automatic Controls**—Mercury-switch equipped controls for heating, refrigeration, air conditioning and other industrial uses are presented in 52-pp Catalog 856. Fully illustrated, book provides ordering and application information on a variety of pressure controls, temperature controls, level controls, limit and fan controls, and many others. Also presents data on relays, and on tilting-type and magnet-operated mercury switches. The Mercoid Corp.

102 **Miniature Instruments**—Bulletin 7202, 12-pp, furnishes descriptive and engineering data on a vertical scale indicator; also shows recorders and controllers, designed to measure and control process variables such as temperature, pressure, flow, and liquid level. Includes full specifications. Industrial Div., Minneapolis-Honeywell Regulator Co.

103 **High Pressure Meters**—Bulletin 537, 8-pp, describes company's line of high pressure meters, covering all three types—positive displacement, double-case and the Duo-Rotor meter. Metering principles, dimensions and specifications, engineering data and pressure-drop charts are included. Granberg Corp.

104 **Mechanical Flow Meters—Specification** Sheet 242-2 describes mechanical flow meters with evenly graduated charts and scales. Includes sectional photo showing important features, dimensional diagrams, and typical specifications. Industrial Div., Minneapolis-Honeywell Regulator Co.

105 **Deflection Indicator**—Bulletin 05B8385, 8-pp, describes a magnetic-amplifier type deflection indicator, applicable to any equipment in which early detection of relative movement is desirable. Tells how it works and includes photos, drawings, schematic and circuit diagrams. Allis-Chalmers Mfg. Co.

ELECTRICAL

106 **Modern Panelboards**—Engineering data pertinent to panelboard installation and selection is provided in 75-pp Catalog 3-205. It is illustrated with photos, drawings, diagrams showing features and construction of each panelboard presented. Circuit breakers as well as fusible disconnect devices used in lighting and distribution panelboards are described. Specifications are provided and among engineering data included is information on transformer connections for distribution voltages; National Electrical Code and UL requirements. Federal Pacific Electric Co.

107 **Control, Instrument Switches**—Bulletin 14 B 8112, 8-pp, describes rotary switches for operating such electrical instruments as ammeters, voltmeters, frequency meters, and P. F. meters, for such control functions as synchronizing, temperature indicating and on-off operations, and for controlling circuit breakers, transformer tap changers, motor operated rheostats, and governor motors. Discusses operation, illustrates installations, and includes ratings and dimensions. Allis-Chalmers Mfg. Co.

108 **Heat-Resistant Cables**—Characteristics, capacities and dimensional data on heat-resistant cables are described in 48-pp Bulletin H-463. Test results are given for butyl rubber insulation under conditions of high heat and extreme moisture. Also included are dimensional tables for power and control cables for direct burial and duct use as well as engineering information on selection and application. Tables, formulas and graphs are included. The Okonite Co.

109 **Aluminum Conduletes**—Bulletin 2681, 24-pp, lists copper-aluminum conduletes designed to resist the corrosive action of many chemicals in highly corrosive locations. A pictorial index and price list cover the various types available. Crouse-Hinds Co.

110 **FHP D-C Motors**—Twelve-pp Bulletin GEA-6068 features fractional horsepower d-c motors and equipment for direct application and built-in use. Included are typical applications, product features, ratings and specifications for standard models. Also described are the facilities, engineering, and application assistance available for the design and production of special models. General Electric Co.

111 **Crane Electrification**—Eight-pp Catalog 2021-A describes company's line of Inverted-Y electrification now available for application on all makes of cranes and runways. Contains drawings and ordering information on aluminum Inverted-Y conductors, supports, and collectors for applications requiring 300 to 1000 amp current. The Cleveland Crane & Engineering Co.

112 **Testing Instruments**—Bulletin 19-56, 16-pp, features company's electrical testing instruments, including ohmmeters, ground testers, dielectric test sets, motor rotation tester, cable fault locating equipment, transformer turn ratio test sets, corona test equipment, frequency meters, tachometers, others. Includes photos and descriptions of each type, including chief features, operating ranges, and suggested applications for them. James G. Biddle Co.

LIGHTING, COMMUNICATION

114 **Fluorescent Fixtures**—Bulletin F-627 features company's industrial-commercial series of fluorescent lighting fixtures. Describes design features, lists advantages, and includes specifications for a number of models, along with a check list to help in selection of lighting units Sylvania Electric Products, Inc.

115 **Visual Alarm Systems**—Technical information on annunciator systems is presented in this 32-pp bulletin, describing typical sequence, typical conditions and occurrences which may be indicated by annunciators, and descriptions of various types for specific applications. Photos, schematic wiring diagrams, dimensions, and ordering instructions included. The Autocall Co.

116 **Annunciator System**—This 26-pp manual-catalog describes annunciator alarms and offers practical information on selection, application and proper function of annunciators throughout the industry. Actually, it is a guide book for plant engineers with monitoring problems, containing design and specification data on the De-Line, Du-All line, S-line, plug-ins, and accessories. Includes photos, wiring diagrams, dimensions. Scam Instrument Corp.

MECHANICAL POWER TRANSMISSION

117 **Power Drives**—Book 2447, 28-pp, features company's line of gearmotors and Motogears, and includes selection data together with features of construction, load classifications, dimension tables, overhung load ratings and mounting assemblies. Design features are illustrated through photos and cross-sectional views and dimension drawings included. Link-Belt Co.

118 **Variable Speed Reducer**—Bulletin 20M0156, 12-pp, describes operating principles of infinitely variable speed transmission with output speeds from zero to ¼ input speed. Standard models are shown with optional variations, typical applications and installation suggestions, dimensions and ratings and description of technical services available. Covers measuring of torque, both starting and running, boosting power or speed, special drives and motors. Revco Inc.

119 **Clutches, Clutch-Coupling Units**—Catalog 103-C, 8-pp, describes sprag type clutches for over-running, indexing, and backstopping applications, as well as clutch-coupling units. Designed as a quick reference guide to selection of company's products, it includes cutaway photos, cross-section drawings, application suggestions, and dimensions and engineering data. The Formsprag Co.

120 **Ball Bearing Screws, Splines**—This 32-pp catalog features operation and design data on company's line of ball bearing screw assemblies and ball bearing splines. Describes principle of operation and such factors as power requirements, lubrication, load characteristics, selection, life expectancy. Includes tabulated data, specifications, typical assemblies, and is fully illustrated with photos, drawings and diagrams. Saginaw Steering Gear Div., General Motors Corp.

121 **Helical Gear Drives**—A new line of in-line helical gear drives is described in 16-pp Book 2651. Load classes for over 250 applications, overhung load ratings and dimension tables, instructions for proper selection and cutaway views of both double and triple reduction drives are given. Link-Belt Co.

FANS, BLOWERS

122 **Industrial Fans**—Bulletin 5306, 72-pp, describes Series 106 fans for industrial air and material handling requirements. Covers wheels and arrangements, optional construction, modifications and special design and construction details for high temperature operation. An elevated temperature application guide offers recommendations for bearings, fan construction, fan arrangement and maximum speed factor in high temperature installations. Selection, rating table terminology, ordering data and operating limits are discussed. Ratings are tabulated and illustrations included. American Blower Corp.

123 **Un-plasticized PVC Blowers**—Bulletin 102, 20-pp, contains complete technical specifications on company's line of un-plasticized rigid polyvinyl chloride blowers. Performance tables on all models and chemical resistance charts are included, as well as application information. Industrial Plastic Fabricators Inc.

WATER TREATING

125 **Water Clarification**—Technical Reprint T-138, 10-pp, discusses operating factors and selection of chemical treatment for water clarification. Covers theoretical chemical problems of coagulation and actual physical considerations. Selection of coagulant and various coagulants available is covered, and table comparing characteristics is included. Jar test procedure is described, and tables of data included. Graver Water Conditioning Co.

126 **Industrial Filters**—Eight-pp Bulletin 111 covers a line of vertical filters for chemical and water purification, describing various devices designed to increase performance and convenience. Applications are detailed, optional equipment is described, and cutaway drawings included. Industrial Filter & Pump Mfg. Co.

MATERIALS HANDLING

127 **Guide to Carrier Systems**—"Airtube on Target" is a 50-pp bulletin describing several Airtube systems, central desk and semi- and fully-automatic switch systems, as well as carriers. Outline diagrams of each type of carrier are provided to aid in determining size of carrier needed. Interesting case history reports of these pneumatic tube systems in several industries are described and illustrated. Many styles of terminals are pictured to show how they fit into building design. Lamson Corp.

You'll save time in ordering Bulletins by using the Reader Service Cards provided on pages 201-202. Of course, we honor letterhead requests—but it takes us a bit longer to handle them.

128 **For Hydraulic Handling**—Pipe fittings and supplies for hydraulic material handling are illustrated and described in 22-pp Bulletin 600. Contains tabulated engineering data on elbows, pipe nipples, special fittings, flap valves, connections, flanges, couplings, steel pipe, hose clamps, and hose. Meckum Engineering, Inc.

129 **Conveyor Units**—How manufacturer's Erecto units can be combined into any conveyor system required is explained and illustrated in

BULLETINS

(Begins on page 21)

this bulletin. Shows use of live roll, roller gravity, belt, and wheel units in a possible installation. Lamson Corp.

130 **Galvanized Conveyors**—Form GAL-55 stresses features of galvanized steel gravity conveyors, telling where they are used to advantage. Gives data on wheel and roller sections available. The Rapids-Standard Co., Inc.

131 **Electric Fork Trucks**—Two electric fork trucks designed for high maneuverability, ease of maintenance, and operator comfort and convenience are introduced in two 6-pp bulletins. Bulletin 1324 covers a 4000-lb. capacity model; Bulletin 1325, a 6000-lb. truck. Performance specifications, dimensions, details on controls and construction are given, features explained, and attachments shown. Baker-Raulang Co.

132 **Excavator Crane**—Forty-pp Bulletin 15-B on a ½-yd shovel type crane, is generously illustrated with on-the-job photos and closeups of mechanical features. Specifications and working ranges are also provided. Text and photos show how this crane is readily convertible to dragline, clamshell, dragshovel, or lifting crane use. Other basic features of crane are described in detail, including revolving frame, crawler mountings, boom lowering control. Bucyrus-Erie Co.

133 **Woven Wire Slings**—A newly published edition of this company's catalog on Gripper woven wire slings, this 16-pp booklet illustrates and describes the slings in detail, provides application photos and gives price and specification data. A section is devoted to slings covered with Neoprene or plastic for use in handling highly finished material, such as polished bar stock. The Cambridge Wire Cloth Co.

134 **Wire Rope Fittings**—Catalog 950-1, 28-pp, shows a complete line of fittings for wire rope and chain. Profusely illustrated with product pictures, catalog includes engineering data and charts, also dimensions and safety factors for links, rings, shackles, swivels, hooks, turnbuckles, clips, sockets, ring bolts, others. The Thomas Laughlin Div., American Hoist & Derrick Co.

135 **Lifting Clamps**—Design and construction details of safety steel lifting clamps are illustrated and described in 12-pp Catalog 950. Includes photos and cutaway views of various types, describes important features, and presents specification data on each of the various models available. J. C. Renfroe & Sons, Inc.

136 **For Flour Handling**—Bulletin TU-1 describes the Airslide transfer unit for unloading bulk flour. Diagrams show how this portable transfer unit can be used with pneumatic pressure equipment. Fuller Co.

137 **Coal Dust Handling**—Bulletin 551-D, on control of dust from coal handling operations, discusses use of local exhaust ventilation and cloth-tube type dust collectors. Four illustrated case histories are presented. Also provided are diagrams of some materials handling systems and how dust control is incorporated in them. Wheelabrator Corp.

138 **Marine Loading Arm**—Bulletin 1055 stresses safety and cost saving features of company's all-metal hydraulically controlled marine loading arm. Describes operation and includes installation photos. Chiksan Co.

On pages 201-202 are postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

SUGGESTED REFERENCES on wall systems . . . steel joists . . . use of timber . . . glazing . . . other aspects of plant construction

140 **Aluminum Wall Systems**—Illustrated in full color, Form AD 535 is the 12-pp 1956 edition of a booklet on wall systems of Alcoa aluminum. Gives advantages of aluminum walls, discusses several types of curtain wall systems, wall system design considerations. Finishes for aluminum and protective coatings are suggested. Color chips of Alcoa architectural color finish are provided. Aluminum Co. of America.

141 **Movable Metal Walls**—How movable metal walls provide space control is the theme of 68-pp Catalog 56, which stresses such advantages as flexibility, economy, early occupancy, attractive design, fire-resistant construction and ease of maintenance. Illustrates typical installations and includes design and construction features, general specifications and detail drawings. The Mills Co.

142 **Wood Construction**—Timber's versatility as an engineering material is pictorially presented in this 24-pp bulletin. A wide variety of structures in which company's connector system was used are illustrated, and applications in clear-span roof construction are shown, as well as examples of three principal methods of design — connector, glued laminated, and Lamella systems. Timber Engineering Co.

143 **Steel Joists**—Bulletin 70-4, 20-pp, describes open web steel joists designed to achieve the maximum in load-bearing capacity with a minimum of weight. Lists advantages and includes tabulated data on properties, linear loads, design data. Installation information covering location and spacing, floors, roofs and ceilings, is provided. Photos and drawings show details. Joseph T. Ryerson & Son, Inc.

144 **Glass for Industrial Use**—How glass is used and how to choose the proper type for the application are covered in 12-pp Catalog 56-1. Discusses glass according to function; light diffusion and glare reduction; decoration; protection; and heat absorption. Photos showing various finishes and typical installations are provided, along with performance data, selection and installation tips, light transmission ratings and other data. General advantages offered by company's line of glass are also detailed. Mississippi Glass Co.

METALS

146 **Steel Hardness Tables**—Available to plant engineers is a pocket-size celluloid card giving approximate relationship between Brinnell, DPH (Vickers), Rockwell and Shore Scleroscope hardness values and corresponding steel tensile strengths. Data is from SAE Handbook. The International Nickel Co., Inc.

147 **Aluminum Mill Products**—This 24-pp 1956 catalog contains engineering data on company's mill products and services, including aluminum alloys, forms, mechanical and physical properties, applications, fabricating and finishing techniques. Data is presented in tabular form, covering sheet, plate, foil, circles, pig, alloy ingot, rod, bar, wire, electrical conductor, forgings, extrusions, billets, roofing. Kaiser Aluminum & Chemical Sales, Inc.

148 **On Cupro-Nickel Tubing**—Alloys for heat exchange problems are described in this 28-pp bulletin presenting typical installations of cupro-nickel alloys in power plants. Corrosion resistant cupro-nickel is shown serving satisfactorily for evaporators, condensers, and feed water heaters. The International Nickel Co., Inc.

PUMPS, PUMPING

149 **Improved Pumps**—High efficiency and low maintenance of company's Wheeler-Economy Type M pumps are stressed in 8-pp Catalog A-155. These pumps are designed for medium and high head services. Cross sections of design are shown for bottom and side suction types, and construction details are included. C. H. Wheeler Mfg. Co.

150 **Centrifugal Pumps**—Bulletin 1020 describes company's Series DE double-ended sealless canned motor centrifugal pumps, and includes cutaway view showing construction details. Includes performance details, dimensions, and operating principles. Chempump Corp.

151 **Wet Pit Pumps**—Sixteen-pp Catalog 3007 covers heavy-duty pumps for drainage, flood water, effluent boiler blow-off, hot wells, acids and alkalis. Illustrations, tables and text give design features of these wet pit pumps. Catalog also includes a condensed version of the Standards of Hydraulic Institute data section listing metals used in constructing pumps for handling various liquids. Also suggests factors to be considered in pump selection. Yeomans Brothers Co.

152 **Air, Vacuum Pumps**—Capacities, dimensions, performance curves and other engineering data on manufacturers rotary air and vacuum pumps are provided in 12-pp Catalog 755. Covers four- and two-wing types, double-cylinder type, motor-driven models, integral pump-motor, air motors. Leiman Bros.

153 **Lubrication Pumps**—Catalog 108 covers a line of compact, cartridge-type lubrication pumps. Dimensions and parts are illustrated through schematic drawings, and performance curves are included showing characteristics. Tuthill Pump Co.

154 **Little Air Pump**—Included in this bulletin are illustrations on company's Dri-Air pump and air filters, the pump is one designed for applications having low cfm requirements at pressures from 20-in. Hg to 10 psi. Pump and filter construction are shown, and a specification table gives speed, capacity, maximum vacuum and continuous maximum pressure for three pump models. Dexter Folder Co.

VALVES, PIPING, FITTINGS

156 **Lubricated Plug Valves**—Catalog PV-4, 36-pp, shows in detail a line of iron and steel lubricated plug valves. Many illustrations of single, screwed and bolted gland type valves are shown, including photos, sectional and detailed drawings. Also included is physical data on dimensions, ratings. The Wm. Powell Co.

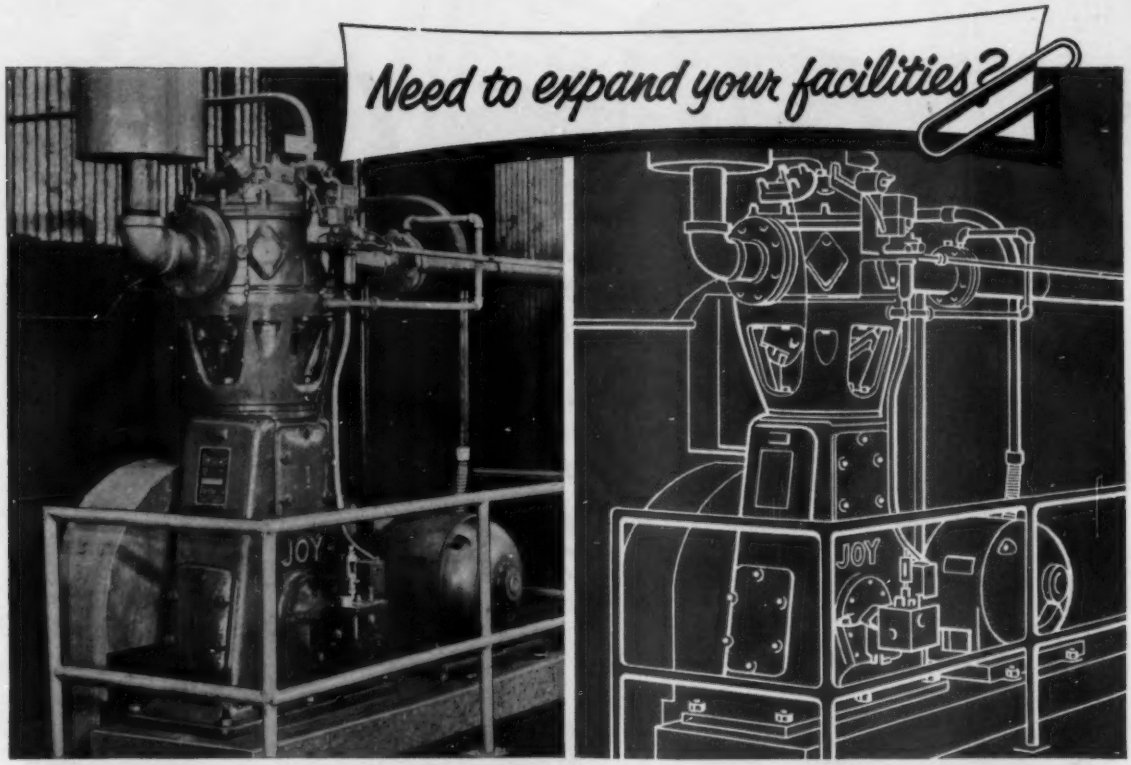
157 **Solenoid Valves**—Bulletin 5-C describes solenoid operated Crescent valves, cataloged by major service condition; air, four-way and three-way, to 150 psi; air, light oil and water, four-way, three-way and dual pressure, to 150 psi. Information on sub-base mounting is also given, and valve characteristics, flow patterns, overall dimensions, photos and ordering data included. Barksdale Valves.

158 **Steel Fittings**—Bulletin S-1-55, 8-pp, contains engineering data and size dimensional information on company's forged stainless and alloy steel fittings. Photos and drawings are included, and specifications, dimensions and other data is presented in tables and charts. Watson-Stillman Fittings Div., H. K. Porter Co., Inc.

159 **Strainers, Air Eliminators**—Bulletin OG-326, 8-pp, describes operating and design features of company's line of strainers and air eliminators. Typical installations, dimensions and specifications are included, as well as photos and dimensional drawings. Rockwell Mfg. Co.

160 **Couplings and Hose**—A wide range of reusable and clamp type couplings and hose assemblies for high, medium and low pressure applications is covered in 28-pp Catalog 300. Also described are features of company's Duloc couplings for QW and QWR hose. Photos show how to assemble couplings and thread information and flow capacity charts are provided, also methods for computing hose length and illustrations of proper installations. Anchor Coupling Co., Inc.

(More Bulletins on page 203)



Add compressed air power efficiently with the JOY WG-9

The Joy WG-9 *heavy-duty* vertical air compressor is a natural for supplying additional air for an existing system, either centralized or decentralized.

Because of its smooth running characteristics and the small floor area required, the WG-9 needs only a simple, block-type foundation. The average base dimensions of a larger model WG-9, *including motor,* are 7′1″ by 4′1″. This means greater capacity per square foot of floor area—42 CFM per square foot on the 100 psi rated machines.

Thus, the WG-9 packs large compressor capacity in a small compressor area. It is possible to install the machine in a central compressor room where unused floor space is at a premium, or in a decentralized plant location where crowding of machinery is a problem.

If you have plans for a small plant, the WG-9 is designed to give you continuous 24-hour heavy-duty service. It is also widely used to meet special requirements in larger operations, such as boosting air above standard plant pressures.

The Joy WG-9 is a water-cooled compressor, available in capacity ranges up to 881 CFM piston displacement and in pressures up to 150 psi. Standard drive is multiple V-belt. This machine can be furnished for flat belt or vee flat drive if desired.

LARGE COMPRESSOR FEATURES INCORPORATED IN ALL WG-9 SERIES

- Full Force Feed Lubrication
- Joy Patented "Dual-Cushion" Valves
- Anti-friction Main Bearings
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Write today for full information. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

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SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

For more facts circle 518 on Reply Card

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—then Lift with AIR with a KELLER AIR HOIST

- **CANNOT BURN OUT from stalling or overload**
- **CANNOT OVERHEAT from rapid reversals or continuous duty**
- **NOT AFFECTED by dust or fumes**

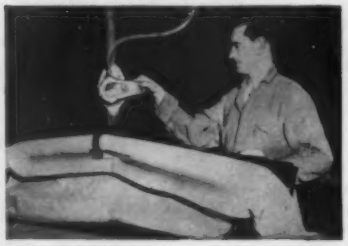
Not only are maintenance costs low, but it is lightweight so that one man can hang it unassisted. Now available in a variety of models with speeds and capacities suited to diversified applications.

Size No.	Capacity	Speed	Weight
86-2V20	2000 lb	19 fpm	78 lb
86-2V20L*	2000 lb	19 fpm	78 lb
86-2V10	1000 lb	35 fpm	78 lb
86-1V10	1000 lb	19 fpm	28 lb
86-1V10L*	1000 lb	19 fpm	28 lb
86-1V5A	500 lb	35 fpm	28 lb
86-1V3	300 lb	80 fpm	28 lb
86A-1 †	150 lb	40 fpm	14 lb

* Link chain hoists—others have roller chains. † Cable hoist.

Versatile New 86A-1 Air Hoist Saves Backaches and Strains

With this new hoist you can handle loads up to 150 lb effortlessly . . . avoid the strains of heavy lifting. Built-in push button control makes it as natural as lifting by hand. Ask for special Catalog 86B.



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THE QUALITY LEADER IN COMPRESSORS, PUMPS, ROCK DRILLS AND AIR TOOLS FOR CONSTRUCTION, MINING, PETROLEUM AND GENERAL INDUSTRY

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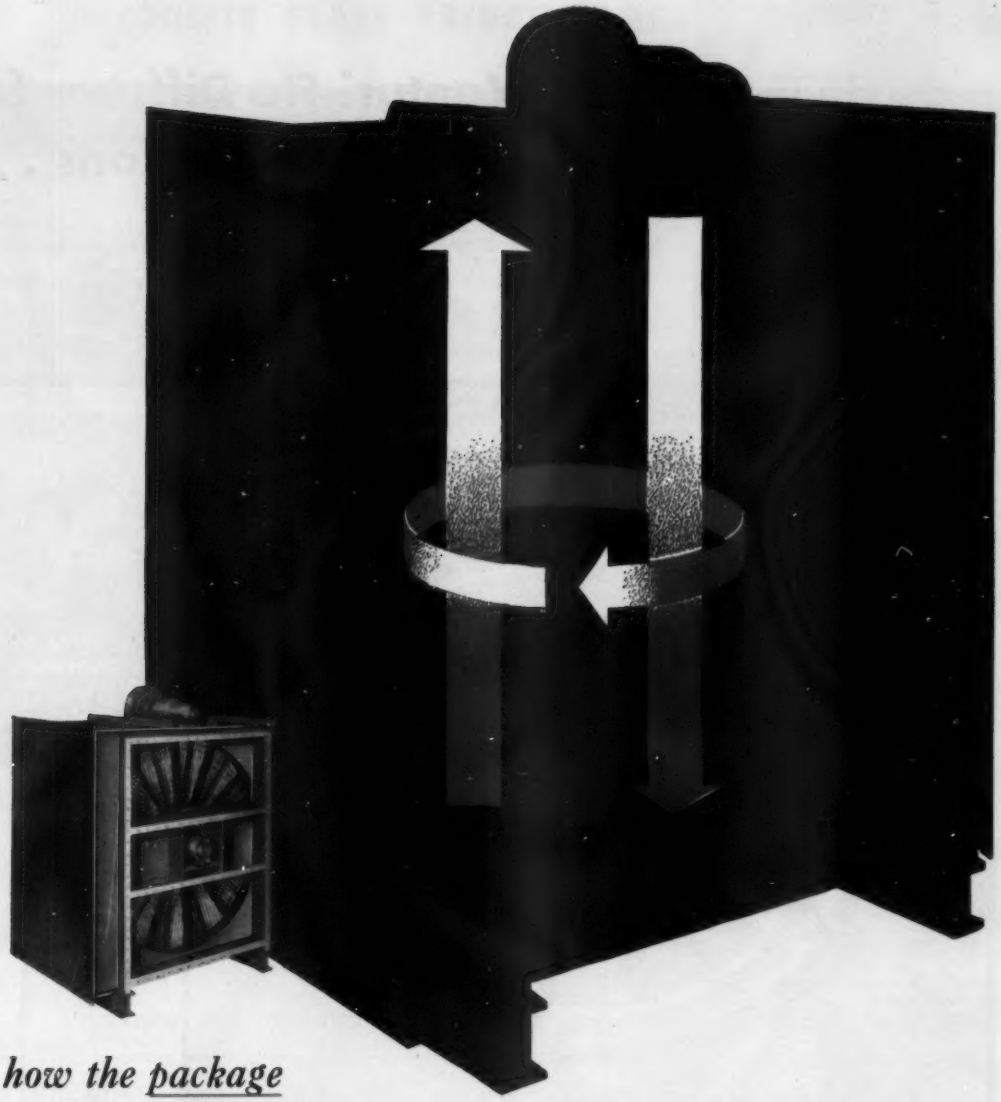

how the package

LJUNGSTROM® AIR PREHEATER

boosts small boiler performance . . .

Advantages of
The Package Ljungstrom Air Preheater

1. Reduces fuel consumption . . . even permits use of low grade fuels.
2. Increases boiler output and reliability.
3. Eliminates cold spots . . . keeps corrosion to a minimum.
4. Easy, fast to clean and maintain.
5. Comes fully assembled—ready to install.

The new, completely *shop-assembled* Package Ljungstrom Air Preheater means that boilers as small as 25,000 pounds of steam per hour can have the advantages of regenerative preheating using the same principle of heat recovery used by large, efficiency-minded utilities.

Here's what the Package Ljungstrom does for you: (1) It saves fuel—roughly 1% for every 45-50 F air preheat. (2) It boosts boiler output and efficiency substantially. (3) Ljungstrom permits use of lower grade fuels. All of which means better performance at lower cost. For more detailed information — get in touch with The Air Preheater Corporation, today. Free brochure on request.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

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BARBER COLMAN

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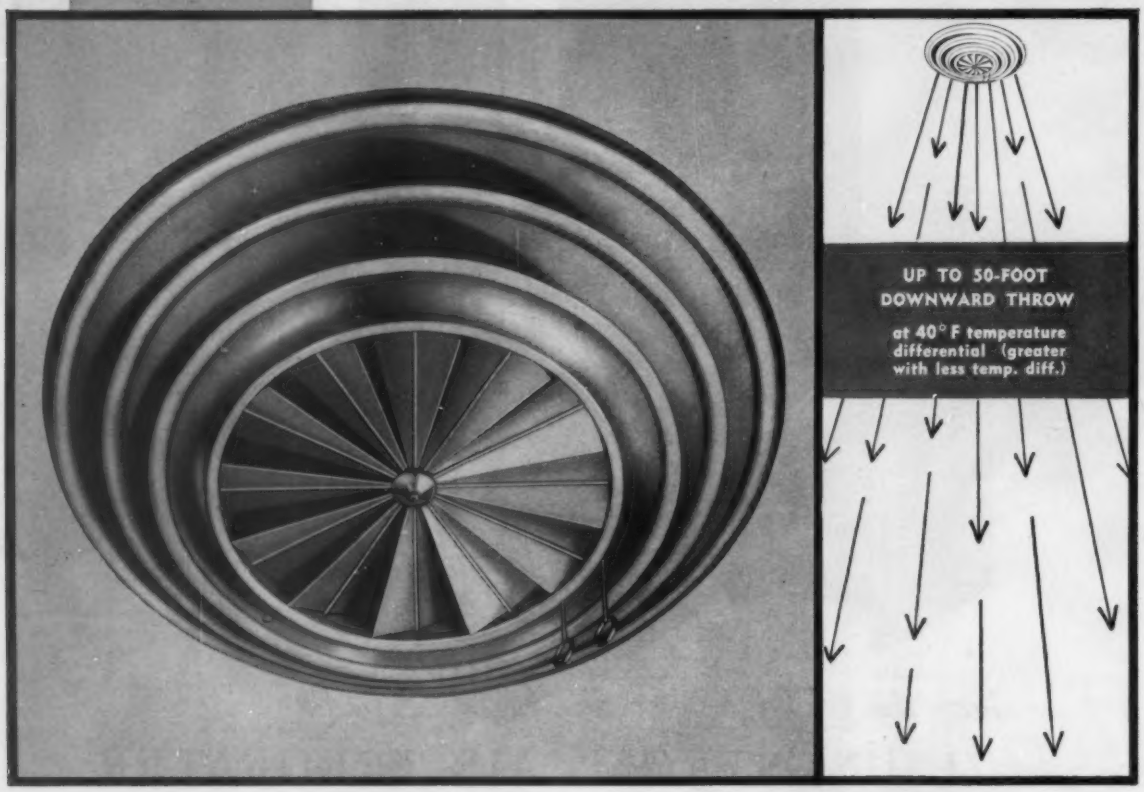
ENGINEERED AIR DISTRIBUTION

New Venturi-Flo Diffuser for high ceiling applications . . .

. . . complete flexibility for effective air distribution in factories, gymnasiums, auditoriums, garages, churches, lobbies . . . handles heated or chilled air



COMPLETE CONTROL of the vertical air pattern for spot heating, or for heating large areas to meet comfort requirements, is provided by the BP Venturi-Flo Diffuser. Adjustable vanes of the pattern control permit full variation of the air patterns from vertical to horizontal . . . adjustable from the floor or through the duct from the crawl space above the ceiling.

For engineering excellence, from product development to product application, come to . . .

LIKE ALL UNI-FLO EQUIPMENT, this new pioneering development has the rugged construction you can depend on . . . the efficient diffusion which assures owner satisfaction . . . the authoritative performance data you can use with confidence. Get complete specifications from your nearby Field Office, or write us . . . today!

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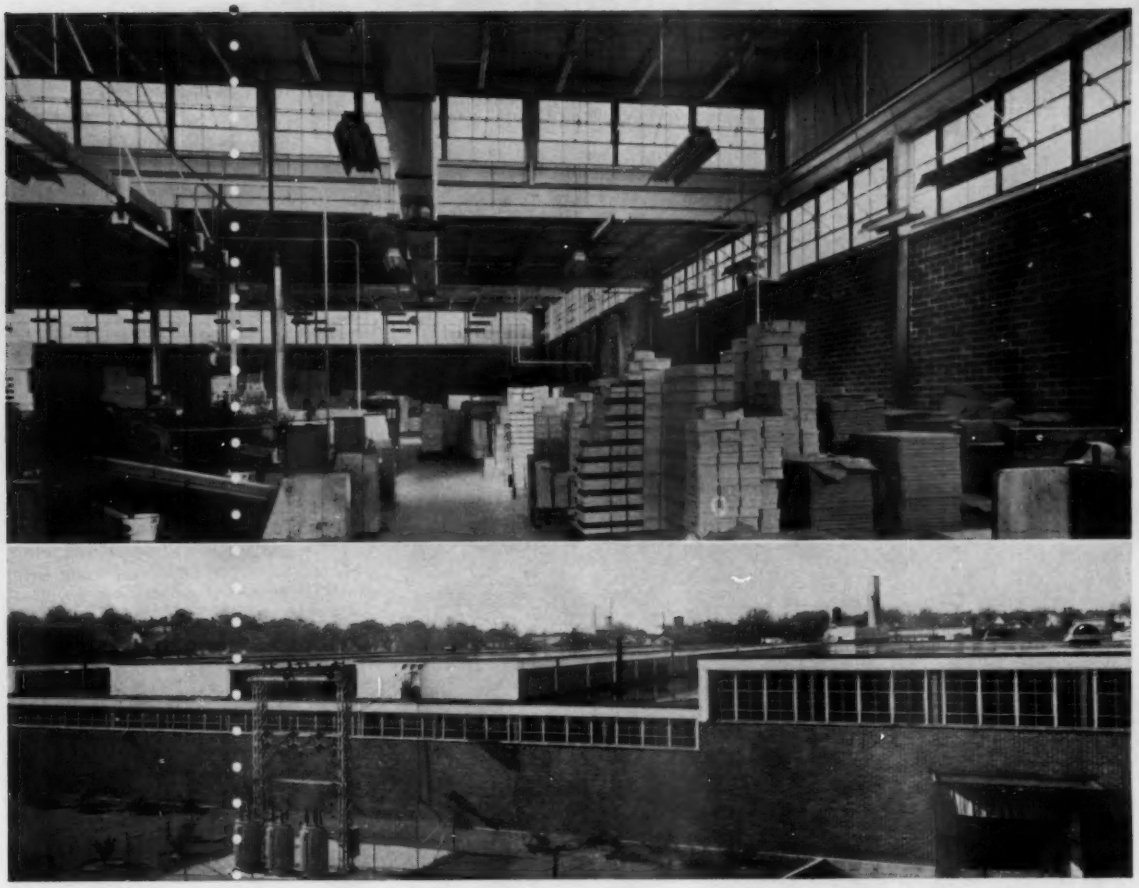
COOLITE GLASS BRINGS COMFORT BY THE ACRE



Moscowitz, Wilner & Millkey, Architect. J. A. Jones, Contractor.

Montag's New Paper Plant Keeps Bright and Comfortable Under 24,000 Sq. Ft. of Coolite

Montag, maker of fine stationery and school supplies for 65 years, recently occupied its new plant.

The Montag building covers 280,000 square feet and was designed to be the most modern stationery and school supply plant in the world. Conceived as an ideal plant for people and machines, it provides finest lighting, heating, humidity conditions and employee working and recreational facilities.

To achieve these aims, it is copiously daylighted with over 24,000 square feet of Coolite Glass by Mississippi. Coolite not only provides high levels of comfortable illumination, diffusing harsh sunlight for visual comfort . . . it absorbs much of the unwanted and uncomfortable solar heat rays, helps keep the vast interior cooler on brightest days.

Employees feel better, see better, work better under Coolite . . . for Coolite filters out unwanted harsh qualities of "raw sunlight" . . . permits extensive use of glass for low cost daylighting without undue heat.

In new construction or modernization, specify translucent light diffusing glass by Mississippi. Manufactured in a wide variety of patterns and surface finishes to help you solve any daylighting problem. See your nearby distributor of quality glass.

see our catalog in **S** or write for copy

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WORLD'S LARGEST MANUFACTURER OF ROLLED, FIGURED AND WIRED GLASS

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SNAPS ON AND OFF THE SHAFT

Quickly and Easily

CHEMPRO *Teflon* SEAL CAGES*

Flexible Chempro Teflon† Seal Cages, for lubricating or cooling stuffing box packing, snap on and off a shaft quickly and easily. They eliminate the time-consuming job of "pulling" the shaft required when conventional lantern rings are used. Machined in a single piece, they fit snugly, with no movement or vibration, even at very high shaft speeds. Their tough construction prevents bending or collapsing under extreme gland pressure.

Chempro Seal Cages do not score shafts as do two-piece metal lantern rings, eliminating the expense of replacing badly scored shafts.

For corrosive service they are unbeatable, lasting many times longer than metal rings under continuous contact with acids, organic solvents, thionyl chloride, etc., at normal and elevated temperatures.

They are made in sizes to fit any shaft diameter and stuffing box bore.

Write for new Chempro Bulletin on the patented Seal Cage.

THE ORIGINAL FABRICATORS OF TEFLON PACKINGS AND GASKETS

*Patented †duPont trademark

CHEMICAL & POWER PRODUCTS, Inc.

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For more facts circle 523 on Reply Card

BACKTALK about our past issues

Edited by Marjorie E. Weissman

Measurement Standards For Maintenance Work

PLANT ENGINEERING:

"Your magazine for December, 1953, (page 70), mentions published standards for measurement of maintenance work. If a bibliography of such data is available, I would very much appreciate your advice on how to obtain it.

"I am particularly interested in standard machine tools. Has there yet been published any material to correspond with the standard times published for auto repairs?" *P. C. Schoenfelt, Industrial Engineer, Dana Corporation, Toledo Div., Toledo 1, Ohio.*

▶ We have selected several articles from past issues of PLANT ENGINEERING that may be of some help to you.

For specific information on standards for machine tools, the Industrial Management Society in Chicago suggested that Mr. F. F. Middleswart, Supervisor of Management Engineering, E. I. du Pont de Nemours & Company, Inc., Wilmington, Del., might be able to assist you. If any of our readers can offer any suggestions, will they write direct to Mr. Schoenfelt?—*Editors.*

Review Prompts Request

PLANT ENGINEERING:

"In a recent issue of National Aluminate 'Nalco Abstracts,' we noticed a review of an article entitled 'Water Softening Methods,' which appeared in the August 1955 issue of your magazine. If a tear sheet or other copy of this article is available we would appreciate receiving one." *J. R. Sinclair, P. Eng., Senior Chemist. Provincial Paper Ltd., (Thorold Div.) Thorold, Ontario, Canada.*

▶ Tear sheets of this article are available and we are pleased to send you a set—without charge, of course.—*Editors.*

Navy's Maintenance Program

PLANT ENGINEERING:

"This is to acknowledge receipt of the tear sheets pertaining to maintenance control.

"The article and its exhibits reflect credit to the new control maintenance program. A more difficult time could not have been chosen to implement such a program; yet, even in the face of the economic pressures, the system is proving to be more helpful with the course of time. It continues to reveal management problems which heretofore were not considered and it is a definite means of knowing where to eliminate non-essentials.

"I wish to express my personal appreciation for the splendid article and for the personal interest of the editors of PLANT ENGINEERING. I would appreciate receiving four additional copies of the article for routing through my staff and line supervision." *G. J. Butcher, Master Mechanic Maintenance, Public Works Center, U.S. Naval Base, Norfolk, Va.*

▶ This article, "Control Maintenance and You Cut Costs," describing the Navy's new controlled maintenance program, appeared in December, 1955.—*Editors.*

Lacquering Aluminum

PLANT ENGINEERING:

"Having read the article which appeared in the December issue of PLANT ENGINEERING on hot spray painting equipment, I would appreciate your sending me further information on the process and the equipment involved. Could you also tell me the feasibility of using hot spray techniques for spraying lacquer on aluminum?" *H. E. McCabe, Chief Engineer, Foster Refrigerator Corporation, Hudson, N. Y.*

▶ Your query was forwarded to Mr. Larry Crosswhite of the Spee-Flo Company, manufacturer of this equipment, located at 720 Polk Ave., Houston, Tex. Part of the reply was, "Spraying lacquer on aluminum with our hot spray equipment is common practice in the aircraft industry where first class adhesion as well as appearance is of great importance."—*Editors.*

Acids Meet Their Match

PLANT ENGINEERING:

"We found the article 'Acid Attacks Stymied—Coatings Protect Plant Floor and Wall' in the November, 1955 issue of PLANT ENGINEERING very interesting.

"I was particularly interested in the Kordell coating for protecting the walls and floor against corrosion, and would appreciate your putting us in touch with the manufacturer so that we could get additional information about this coating." *H. G. Haussig, Resident Engineer, Crown Steel Products Co., North Main Street, Orrville, Ohio.*

▶ Mr. R. E. Humphrey, Jameson Chemical Co., 154 East Erie Street, Chicago 11, Illinois, is the man to contact for additional information.—*Editors.*

Better Late —

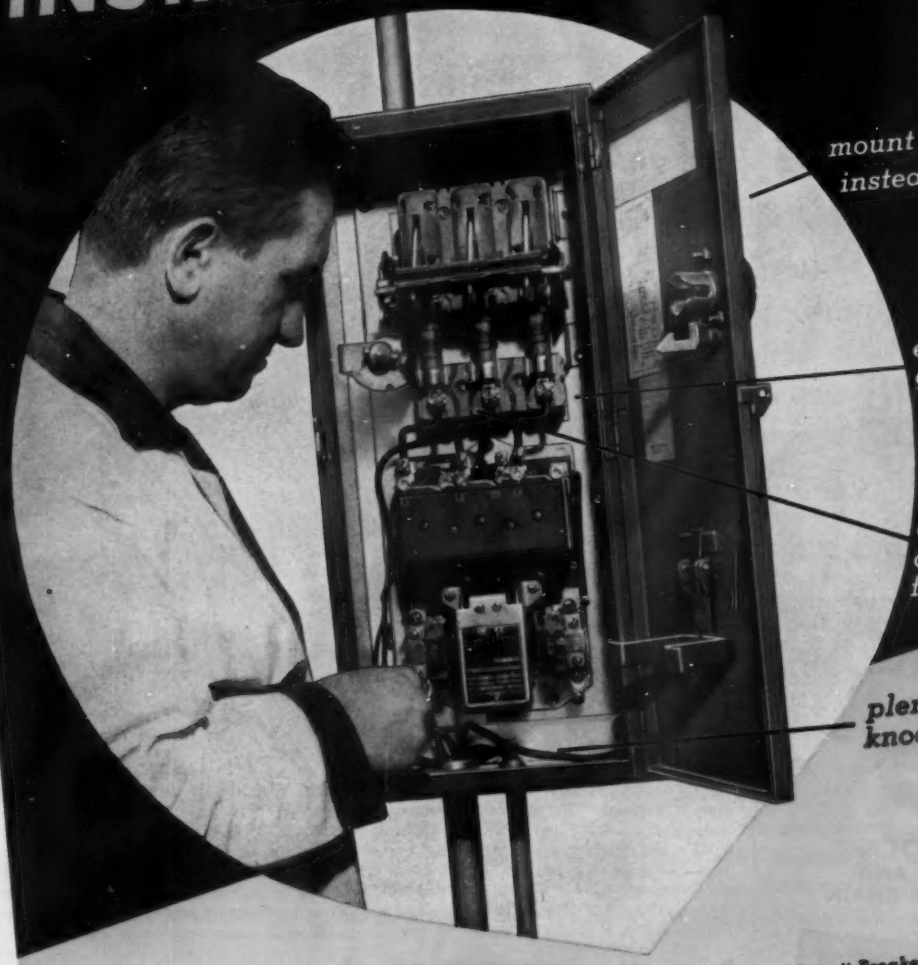
PLANT ENGINEERING:

"In reading the 'Backtalk' section in your December, 1955 issue, I was somewhat consoled to discover that others are behind in catching up on their reading.

"We too, would appreciate receiving tear sheets on 'GM's New Piping Color Code,' which appeared in your August

For more facts circle 524 on Reply Card ——▶

EASIER TO INSTALL AND MAINTAIN!



mount 1 device instead of 2

extra-wide gutters

all components accessible from front

plenty of knockouts

SQUARE D COMBINATION STARTERS

(Switch or Circuit Breaker Types)

Save space and time. Mount and wire one device instead of two . . . neater, more attractive installations.

Write **for Bulletins 8538 and 8539**
Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

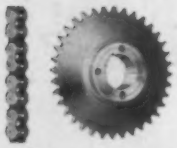
ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DODGE PRODUCTS you should know

FLEXIDYNE
THE DRY FLUID DRIVE

TAPER-LOCK SHEAVES



TAPER-LOCK SPROCKETS AND DODGE ROLLER CHAIN

DODGE BULLETINS YOU SHOULD HAVE

1 FLEXIDYNE Dry Fluid Drives and Couplings. Complete story, technical information and selection data. Bulletin A-640-A.

1 TAPER-LOCK Sprockets, Chain Couplings and Dodge Roller Chain. Technical information — selection, installation and maintenance data. Bulletin A-644.

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of Mishawaka, Ind.

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BACKTALK

1954 issue. We have already written to ASME for their booklet.

"Many thanks for the many good tips we get and hope to get in your publication." *G. M. Thorpe, Engineering Department, T. C. Wheaton Company Millville, New Jersey.*

▶ We have received so many requests for tear sheets of this article, that our stock is all but exhausted. However, we will continue to fill requests as long as the supply of tear sheets lasts.—*Editors.*

Maintenance Costs Survey

PLANT ENGINEERING:

"We wonder if we might ask you to supply us with another set of tear sheets on the article, 'Maintenance Costs' by B. A. Margo, which appeared in the September, 1955, issue of PLANT ENGINEERING.

"Our company is conducting a survey on equipment obsolescence and maintenance, and, therefore, the reason for our interest in these particular articles." *C. W. Wirshing, Equipment Engineer, Behr-Manning, Div. of Norton Co., Troy, N.Y.*

▶ Glad to send you the tear sheets you ask for and along with them, we are sending tear sheets on 'Controlling Obsolescence of Maintenance Parts,' and 'Control Maintenance and You Cut Costs,' both from our December issue.—*Editors.*

Painting Small Parts

PLANT ENGINEERING:

"We would like to obtain further information on the small parts painter which was designed by the Glenn L. Martin Company of Baltimore, Md., and shown on page 120 of the November issue of PLANT ENGINEERING.

"We are interested in this device for painting clock hands and other small clock parts." *S. G. Payne, Purchasing Agent, Western Clock Company, Ltd., Peterborough, Ontario, Canada.*

▶ The Glenn L. Martin Company indicated that it was planning either to produce this painter commercially, or would license another firm to do so. We suggest, then, that you get in touch with Mr. Joe Rowland, Manager, Information Services, Glenn L. Martin Company, Baltimore 3, Md.—*Editors.*

Engineering Service Brochure

PLANT ENGINEERING:

"The Engineering Service Division of our company is interested in publishing a brochure on their maintenance engineering services. This proposed booklet is for internal company use only and is to be used to acquaint engineers located in our plant with these specialized engineering services.

"In preparing such a booklet, we are particularly interested in obtaining information that will give us the best possible layout and presentation of our material. With your experience in the layout of engineering advertising in your magazine, we would like to ask your assistance on this problem. Could you suggest to us how we could obtain such information or who could advise us on this question?" *R. C. Steinfeld, Engineering Service Division, E. I. du Pont de Nemours & Company, Inc., Wilmington, Del.*

▶ It would be rather difficult for us to set down several rules or regulations for preparing such a brochure. Because of this, we thought it best to send you several samples of brochures that we have here in the office. We are sure they can do a better job than we in supplying you with helpful suggestions. The one which will, no doubt, be of most help to you is that from the Teller Company.—*Editors.*

Magnetic Midgets Draw Interest

PLANT ENGINEERING:

"Please send me some additional information concerning the 'Magnetic Midgets' discussed on page 126 of your January 1956 issue. I would like to know the name of the manufacturer and application information." *W. L. Clark, Power Engineer, Maintenance Department, Armco Steel Corporation, Middletown, Ohio.*

PLANT ENGINEERING:

"In the January 1956 issue of PLANT ENGINEERING, you have a very interesting article on 'Industry's New Magnetic Midgets'.

"It would appear that these new devices would have some very definite applications in our industry. May we have additional information regarding this product?" *Paul Gooder, Electrical Supervisor, Union Oil Co., Los Angeles, Calif.*

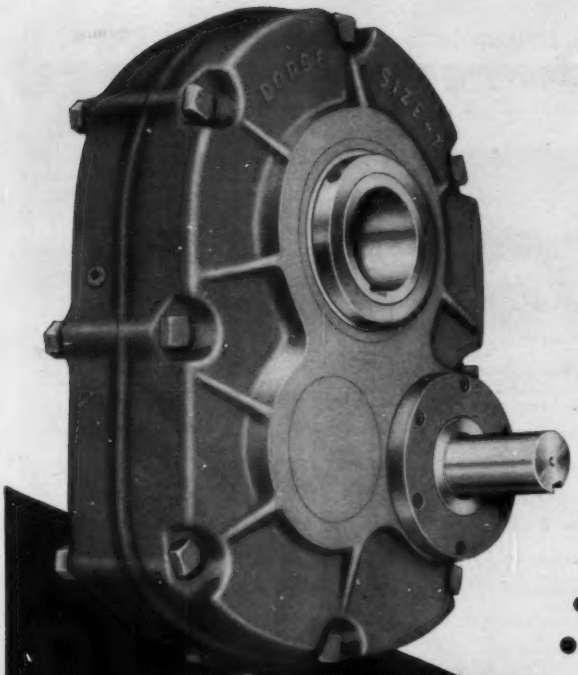
▶ The magnetic instruments described in the article are manufactured by the Berkeley Division of Beckman Instruments, Inc., 2200 Wright Ave., Richmond 3, California. We have forwarded your names to Mr. A. E. Young, Jr., of that company, telling him of your interest in these instruments and of your request for additional information.—*Editors.*

Raising Concrete Slabs

PLANT ENGINEERING:

"In your March 1953 issue, you carry an article on the raising of concrete slabs by use of a mud jack. There is a possibility that we may be able to use this technique in the near future. Please advise us of vendors handling this equipment." *Dale Kisbaugh, Ass't Plant Engineer, United States Gypsum Company, Empire, Nevada.*

▶ The equipment described was the Koehring mud jack. The Koehring Company is located at 3038 W. Concordia Ave., Milwaukee, Wis. They also have a representative in Chicago, the Gil Boers Equipment Company, at 7625 S. Kedzie Ave., Chicago, Ill. Mr. E. Barthel would be the man to contact there.—*Editors.*



97% EFFICIENCY

- NO FOUNDATION
- NO FLEXIBLE COUPLING
- NO SLIDING BASE
- NO LINING UP PROBLEM

—that's Torque-Arm

THE DODGE SHAFT-MOUNTED SPEED REDUCER

Proved in tens of thousands of installations, in all types of industry, this new and better kind of speed reducer delivers up to 97% efficiency . . . makes savings up to one-third!

Mounted directly on the driven shaft, the reducer is anchored by the Torque-Arm, fastened to any fixed object. No need for foundation, flexible coupling or sliding base. No lining up difficulties. Unit is driven through any V-belt drive. Stock Taper-Lock Sheaves prescribed for each job. Tri-Matic Overload Release and Backstop available if desired.

Dodge Torque-Arm is America's most complete line of shaft-mounted speed reducers — single and double reduction series—capacities from 1 hp to 60 hp; output speeds of 12 to 365 rpm. Sold from Distributors' stocks.

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2700 Union Street, Mishawaka, Indiana

Call the Transmissioneer, your local Dodge Distributor. He can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Machinery" in your classified phone book, or write us.

DODGE
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Look to these leading manufacturers for Industrial Lighting Units with the RLM Label

NOW MORE VALUABLE THAN EVER!

With continuous advancements in RLM Specifications, the RLM Label on an industrial lighting unit stands for ever-higher quality standards in lighting equipment performance and construction. Alert, forward-looking manufacturers realize that this makes the RLM Label more valuable than ever to buyers, specifiers and users of industrial lighting equipment. That is why you will recognize the 28 RLM manufacturers above as the leading names in their field . . . companies who will faithfully adhere to the RLM Standard Institute's rigid program of certification . . . firms which gladly submit to the strict RLM testing and inspection program, which assures uniform quality and conformance to standards by periodic inspection on the assembly line and in the field. Today, these manufacturers are especially proud to be able to bring you units bearing the RLM Label, because they know that it is now of even greater value to you than ever before.

Today, the RLM Label stands for higher-than-ever specifications like these:

Incandescent and Fluorescent: New High Reflection Factor. New High Light Output.

Fluorescent: All-White Porcelain Enamel Reflectors. Upward Light for more Brightness Control. Shielding Angles for less Lamp Glare.

For a complimentary copy of the 1956 RLM Specifications Book, write: RLM Standards Institute, Suite 831, 326 W. Madison St., Chicago 6, Ill.

R-1229RR

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COMPLIANCE WITH RLM STANDARDS VERIFIED BY ELECTRICAL TESTING LABORATORIES, INC.

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The letters RLM stand for Reflector and Lighting Equipment Manufacturers

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Dependable

...more overhead crane users place their faith in P&H than any other brand

Dependable? P&H Overhead Cranes *have* to be dependable. And we make sure they are!

Every time we install a P&H Overhead Crane we accept the responsibility of keeping that business running, shift after shift, day after day, year after year. If *any* crane breaks down, even in its tiniest part, production suffers, men are out of work, and the word "downtime" begins to appear in the supervisor's reports.

Fortunately, P&H Overhead Crane users aren't familiar with the word.

Proof? Well, for example, there are over 1500 P&H Overhead Cranes — built more than 50 years ago — that are still in dependable service.

The best time to call us in on your overhead crane job, is right at the beginning — at the very inception of the building you have in mind. Our experienced engineers will be glad to work with your men. Naturally, there is no charge for this service.

In the meantime, if you want to dream of the day *your* business will own a P&H Overhead Crane, send for our complete file of free catalogs and literature.

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MILWAUKEE 46, WISCONSIN

the P&H *line*

TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PREFABRICATED HOMES · HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

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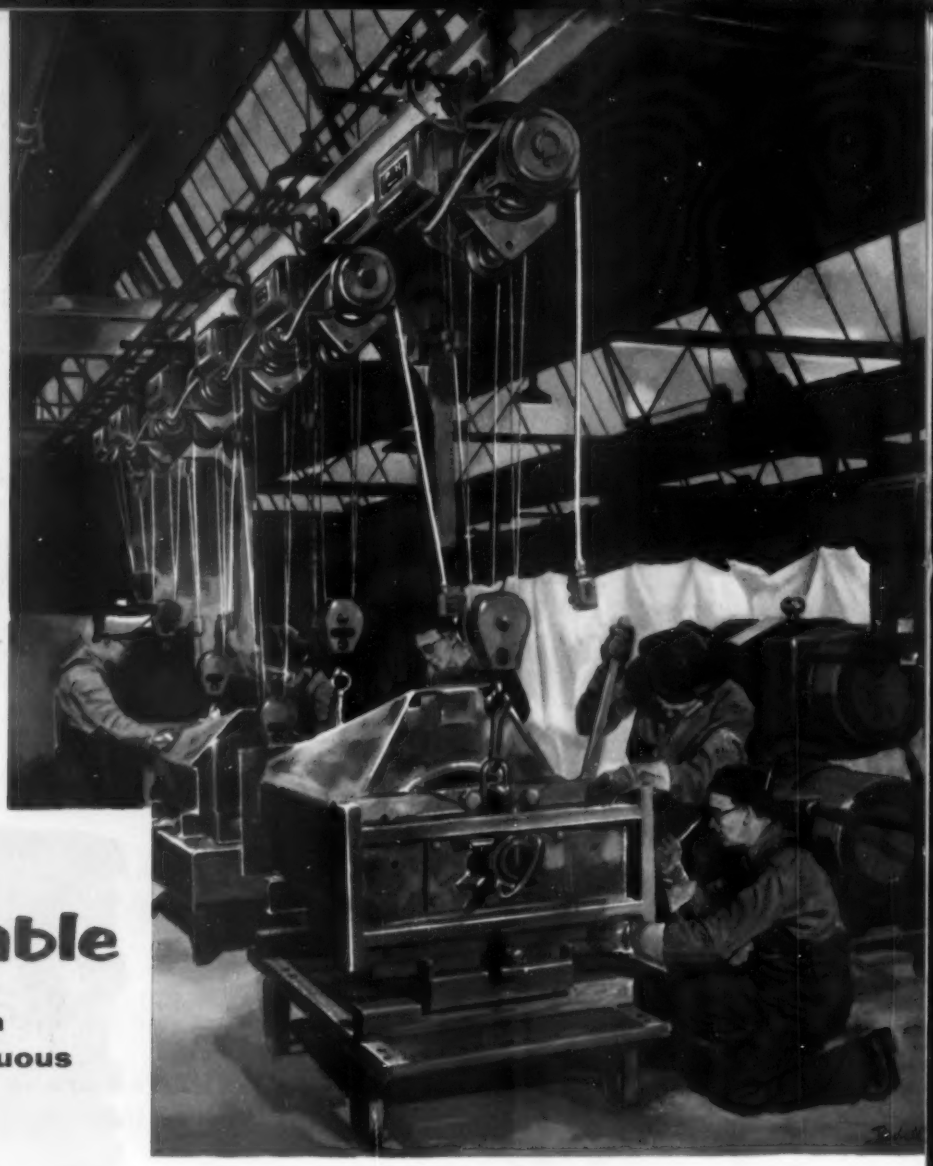

Dependable

...users depend upon P&H Hoists for continuous service and safety

There's two-fold dependability built into every P&H Hoist. Dependability for continuous service with a minimum of downtime, and dependability of safety that protects the worker.

For instance, every P&H Hoist has two brakes for double protection. The mechanical load brake is of the sturdy ratchet-and-roller type — provides controlled lowering and positive holding. Never needs adjustment.

The motor brake on the smaller units is an improved, solenoid, dry-disc type — and on the larger models a multi-dry-disc, magnetic, direct-acting, D.C. rectifier pot type. The elimination of linkage offers instantaneous control for precision hoisting and lowering.

Your P&H sales engineer will be glad to demonstrate these and other safety features, and to quote case-history figures on P&H Hoist installations. Call him, or write us for an appointment.

HARNISCHFEGER

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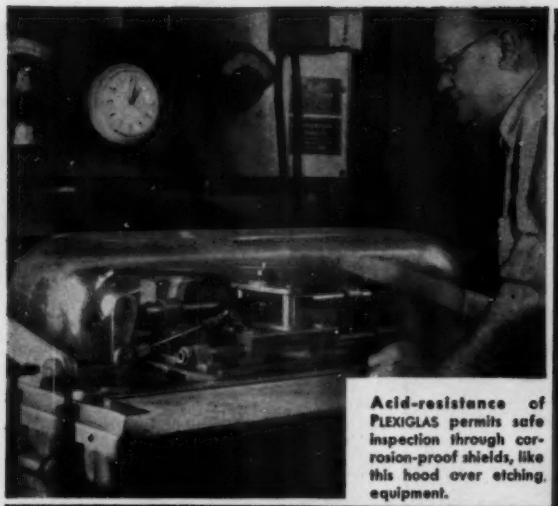
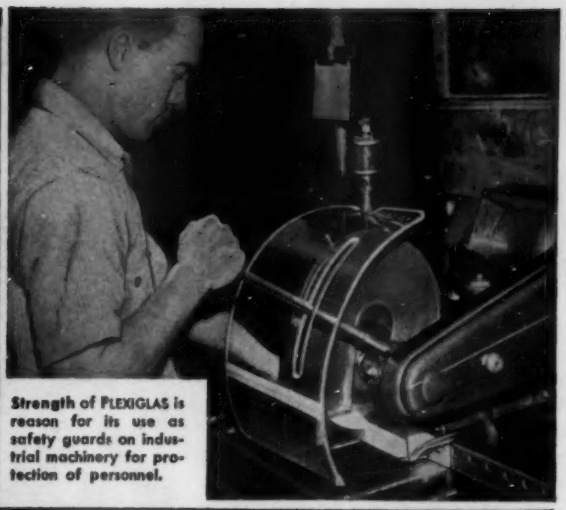
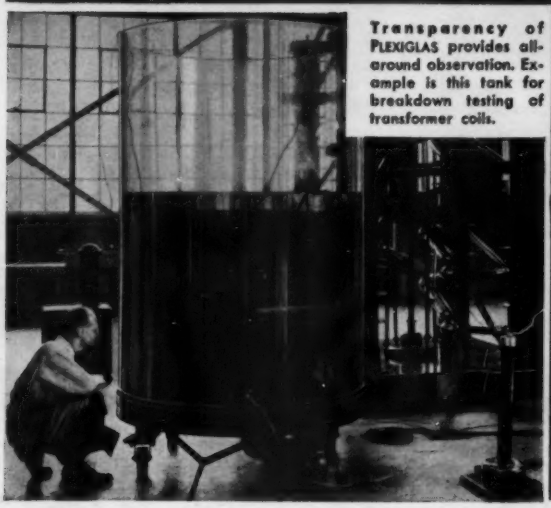
3112



Acid-resistance of PLEXIGLAS permits safe inspection through corrosion-proof shields, like this hood over etching equipment.



Strength of PLEXIGLAS is reason for its use as safety guards on industrial machinery for protection of personnel.



Transparency of PLEXIGLAS provides all-around observation. Example is this tank for breakdown testing of transformer coils.

Breakage-resistance of PLEXIGLAS results in minimum replacement costs when material is used for window glazing.

Plexiglas —useful in so many ways around the plant

PLEXIGLAS® acrylic plastic is a mighty handy material around a plant. Shown above are just a few of the many ways it is being used to provide safety, increase efficiency and reduce costs in industrial operations.

PLEXIGLAS has crystal-clear transparency, great strength, and is light in weight. It is resistant to most chemicals. Electrical properties are excellent. The long-established reputation of PLEXIGLAS as "the outdoor plastic" indicates its durability under severe conditions of use, indoors or out. In addition, PLEXIGLAS can be heated and formed to almost any shape, can be sawed, drilled and machined like wood or soft metals. A brief investigation will show you many places in *your* plant where a material with this combination of advantages can be used profitably.

PLEXIGLAS R, the lower-cost grade, is especially suitable for industrial plant applications. Call your nearest dealer for information and quick delivery. Dealers are listed under PLEXIGLAS in classified telephone directories of most cities.

Send for This Booklet

Our "Design and Fabrication Manual" tells how to work with PLEXIGLAS. We will be glad to send you a free copy.

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For more facts circle 529 on Reply Card

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

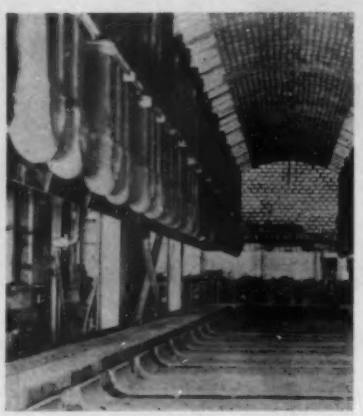
Edited by Marjorie E. Weissman

Bar Stock Annealed, Restored In Radiant Furnace

RADIANT TUBE furnaces in which heat resistant, high alloy castings are used, are being employed in annealing and carbon restoration of bar stock. Type HH (25 per cent chromium, 12 per cent nickel), or type HT (15 per cent chromium, 35 per cent nickel) are the alloys used.

Because a slightly carburizing atmosphere is needed for carbon restoration, the radiant heat tubes are made of type HH castings; for the "buck" castings which support the bar stock, type HT was used. Average temperature in this furnace is 1600 F, with a maximum of 1750 F. Tubes, which weigh about 250 lb each, have been in service for 10 years, and the supports, weighing 100 lb apiece, for more than four years. All are still in good condition.

In cases where it is desirable to avoid surface corrosion by preventing the products of combustion from reaching the material being processed, radiant heating is economic and efficient.



Tubes in radiant furnace, used for annealing are of heat-resistant alloy

Temperatures varying from 1500 F to 1750 F can be achieved in the furnace by passing hot gases through the tubes.

The HT type alloy in the tubes is useful also in carburizing and carbonitriding atmospheres. Containing up to 1.25 per cent silicon for increased resistance to carburization, this type operates satisfactorily at temperatures up to 2100 F in oxidizing atmospheres and up to 2000 F in reducing atmospheres. *From a release of Alloy Casting Institute, New York, N. Y.*

Small Scale Automation

USE OF A pair of automatic drill units has led to a production increase of more than 300 per cent on a facing and deburring operation on welded steel pipe at Star Tubular Products Company, Chicago, Ill.

The drill units are standard models with built-in pneumatic and electric controls, which simplified installation and reduced control problems.

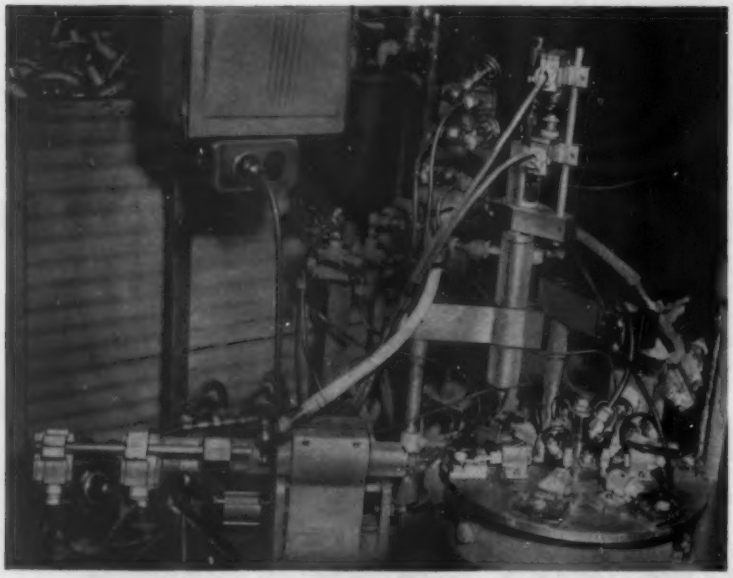
Formerly, the facing and deburring job required handling each part three times—once to do one end; then a separate handling operation to remove the part and reverse it in the work fixture; and finally the facing and deburring of the opposite end.

Now, the pipe sections are stacked in a hopper which delivers them to a fixture. As the part falls into the fixture, a clamping device is actuated.

(Continued on page 38)

Pneumatic Drills Increase Short Run Production of Aluminum Vents

STEPPING UP production from 72 to 318 parts per hour was accomplished with the use of a specially designed fixture employing three pneumatic drills to drill holes in aluminum vent parts made from 11/16-in. bar stock.



Three pneumatic drills converge on parts held by air-operated clamps on turntable

The fixture was designed by Penn Controls, Inc., Goshen, Ind., for producing items in limited quantities where tooling costs could not be high.

One of the drills was mounted vertically on a miniature column, the two others were mounted horizontally on wing bases. The table has six individual work-holding fixtures. The part to be drilled is located in a sliding V-block which is actuated by a miniature air cylinder.

Use of this fixture provides accurate speed and feed rate controls to eliminate tool breakage. Previously, two operators were employed to drill a 0.087-in. diam hole with a combination drill that produced a 0.159-in. counterbore. Following this, a ⅛-in. diam hole was drilled, and finally a 0.0135-in. diam hole. Difficulties were encountered by the operator in controlling the feed rate of the drill used to make the 0.0135-in. diam hole, and drill breakage was excessive. *From Production Ideas, published by Keller Tool Division of Gardner-Denver, Grand Haven, Mich.*

No costly maintenance problem here

In addition to its clean, trim appearance . . . Johns-Manville Corrugated Transite offers years of low-maintenance service and fire safety to Seaboard Finance Company's new Los Angeles office.

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For maintenance-free exterior walls and roofs, plus protection from fire, rot and weather

YOU SAVE MONEY on construction and maintenance when you build with Johns-Manville Corrugated Transite®. Corrugated Transite comes in large sheets that require a minimum of framing . . . permit fast, economical construction of industrial, commercial, institutional and agricultural buildings.

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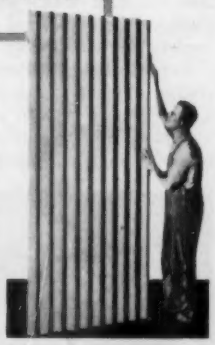
Investigate Johns-Manville Corrugated Asbestos Transite and learn how you can build quickly and easily . . . have an attractive, long-lasting, trouble-free structure regardless of size or purpose. For complete details, write Johns-Manville, Box 158, Dept. PE, New York 16, New York. In Canada write 565 Lakeshore Road East, Port Credit, Ontario.



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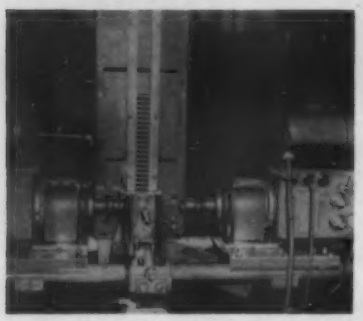
PLANT ENGINEERS' DIGEST

(Digest begins on page 36)



Two drill units, with simple feedhopper, face and deburr steel pipe sections at three times rate of previous method

This also triggers the two drill units which advance both drill heads simultaneously, face and deburr both ends of the part and then retract. These operations are automatic. Work feed is controlled through the automatic circuits in the drill units.

Increased accuracy of the finishing process has permitted the company to roll-cut the pipe sections instead of square cutting, for a three-fold reduction in cutoff time. *From a release of Dumore Company, Racine, Wisconsin.*

Radioactive Materials—Fire Hazards?

RADIOACTIVE byproducts, being used increasingly in biological research, medical diagnosis and therapeutic treatment, are also being used to control various operations in metallurgical and chemical manufacture; for fundamental studies of complex chemical reactions; lubrication efficiency, motor wear and corrosion control; for gages to register the thickness of film coatings and sheet materials; for radiographic examination of welding, foundry work, steel structures and for dissipation of electrostatic charges on moving parts of machinery.

To formulate specific recommendations for safeguarding locations where radioactive materials are stored or handled, the Factory Mutuals have studied the hazards involved, and offer the following analysis.

Radioactive isotopes do not introduce any additional fire or explosion hazard by their presence, nor are the direct fire and explosion characteristics of any material affected by the presence of the isotopes.

The real problem in fire prevention and protection in the presence of radioactive isotopes is that inadequately informed fire fighters may be reluctant to enter an area with radiation hazards. This could result in inefficient fire fighting with greater than normal fire spread. Also, contamination may delay resumption of production after a fire.

Plants using radioactive materials should familiarize public fire departments with the areas in which they are being used, so that firemen may work with maximum efficiency. The inherent fear of radioactivity is the element that must be overcome in the men who must fight the fires.

Special protective clothing and masks should be provided for fire-

(Continued on page 40)

Water Seal on Air Fans Cools and Seals Simultaneously

DUST AND HOT AIR, continually leaking out through the shaft openings on primary air fans on high pressure boilers, were an old problem at the Trenton Channel power plant of Detroit Edison Co., Detroit, Mich. This leakage had resulted in a number of costly bearing failures.

The primary air fans take hot, dust-laden air, under pressure, from the forced draft fans, and discharge it into the duct which supplies air for transporting powdered coal from the feeders to the individual burners.

Because both the suction and discharge of the fan are under pressure, a seal is necessary to prevent the hot air blowing out through the shaft openings in the housing.

At least five different types of seals, including mechanical, labyrinth air, and centrifugal, have been used since the boilers were put into operation in 1949. All these types were inadequate and most of the time operators were forced to keep air hoses blowing on the bearings to prevent failure.

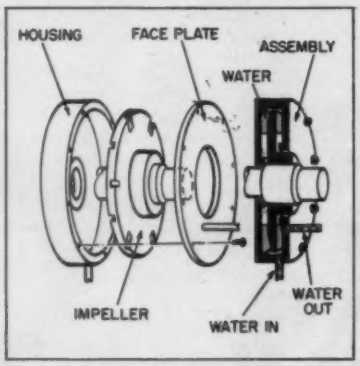
It was suggested that a water seal might prove effective on the shaft, since this type of seal was in use on exhaust casings of steam turbines.

The seal consists of a steel disc shrunk onto the shaft, so that it will rotate with the shaft inside the seal housing. Water admitted to the bottom of the housing is picked up by the rapidly rotating disc and is carried around the periphery of the housing by a combination of tangential and centrifugal forces. The water actually forms a ring or "doughnut" of water, the thickness being maintained by a scoop or leveling port.

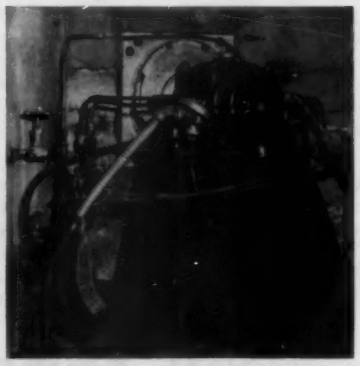
The disc, spinning in the doughnut of water, not only makes an effective seal but also transmits heat from the shaft, keeping the shaft bearing cool.

Several different models of the seal have been tried. The latest, with a cadmium-plated, one-piece seal housing, appears to be successful but since cadmium will not stand up under the necessary operating conditions, the actual service seals will be made of stainless steel or bronze. *From Power Engineering, published by Technical Publishing Company, Chicago, Ill.*

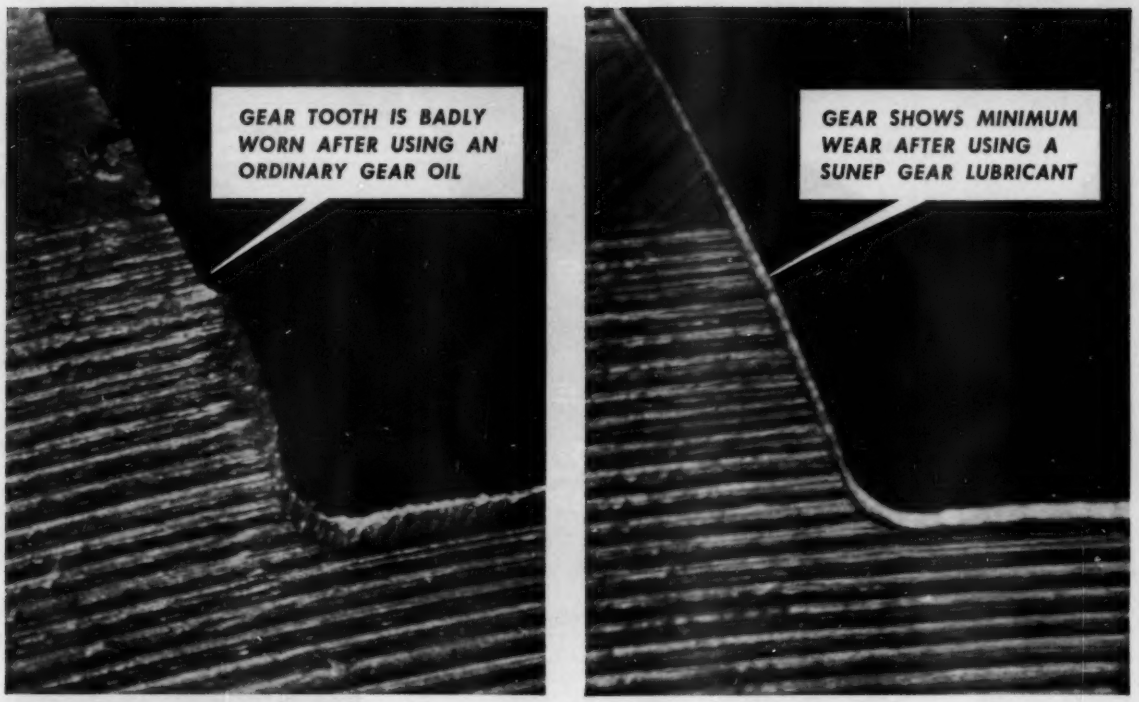
Old seal allowed dirt to collect like this



Exploded view of new type of water seal



New unit prevents fan bearing clogging



COMPARATIVE TESTS on identical new worm gears demonstrate superiority of Sunep Gear Lubricant. Gear on left, using a compounded cylinder oil, shows excessive wear at 70 hours. Gear on right, protected by Sunep, shows minimum wear after running over 200 hours!

HERE'S PROOF SUNEP GEAR LUBRICANTS MINIMIZE WEAR

Sunep Gear Lubricants cut power losses...protect against overloads ...lengthen gear life...reduce maintenance costs and replacements.

During recent tests gear units protected by Sunep Gear Lubricant showed an absolute minimum of wear when run at normal rated capacity. There was no indication of scoring or wear even when run at overloads up to 118%! Power consumption was reduced up to 25%. Damage from shock loads was nil.

In addition to outstanding load-carrying ability, Sunep Gear Lubricants are extremely stable, non-corrosive, prevent rusting, keep gears and bearings clean.

For complete information about how Sunep Gear Lubricants can help give longer life to your worm gear units, see your Sun representative...or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-3.

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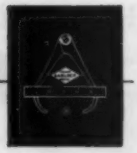

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

men operating in contaminated areas.

Automatic sprinklers are the most effective protection against fire damage when combustibles are present, because they will prevent the spread of fire into areas containing radioactive materials. Low pressure water spray is desirable because it is less likely to spread radioactive materials than is a solid water stream, and the spray has a tendency to collect and settle any radioactive dust in the air. *From Factory Mutual Record, published by the Factory Mutual Engineering Division, Norwood, Mass.*

Heaters Keep Chute Clean

BECAUSE of cold weather during the winter, a chute conveying wet slack coal, at the strip mine of the William Aloe Coal Company, Imperial, Pa., froze and clogged.

Unit heaters in slot (arrow), prevent freezing of wet slack and clogged chute

A handy solution to this small but annoying problem was to clamp 6 kw of electric strip heaters to the chute. The wet slack could not freeze, and the chute remained clear. *From Industrial Electric Topics, published by Duquesne Light Company, Pittsburgh, Pennsylvania.*

Baby Baths Collect Scrap

SMALL PLASTIC baby baths have been the means of increasing revenue from the sale of scrap at our Clifton, N. J., plant.

Holes, to allow the drainage of cutting oil, are drilled in the bottom of each tub. The tubs are then placed in the beds of hand and automatic screw machines, where turnings from ma-

Tuffy® SLING NEWS

Vol. 1 Published Monthly in Leading American Trade Magazines by Union Wire Rope Corp. No. 5

NEW FERRULE TEAMS UP WITH Tuffy® FABRIC FOR BETTER SLINGS

Strength of Machine Braided Fabric Equaled in Eye-Splice

SPEEDS UP SLING WORK

See for yourself at your Tuffy distributor's how this new, steel ferrule on all Tuffy Slings is streamlined with no rough edges to injure hands or catch on loads.

The new ferrule on all Tuffy 9-part machine braided wire fabric slings is the most important development in slings since Tuffy made history by introducing machine braided wire fabric. Here's why:

1. This new ferrule, squeezed around the tucked eye splice of Tuffy Slings, under pressure, creates a force of friction so powerful that a pulled out splice is virtually a thing of the past.
2. Because the ends of the ferrule are swaged flush with the machine braided strands, there are no projections left to snag on loads or injure hands. As a result, handlers can work much faster and with greater safety—doing more in a shorter time—when they're working with flexible, Tuffy Slings.

3. You pay nothing extra. The new Tuffy eye-splice with pressed on metal ferrule gives you a far better Tuffy Sling—but at the same reasonable price.

As always, Tuffy Slings are extra flexible and kink-resistant. It's almost impossible to kink a Tuffy. But if it does kink, you can always straighten it without materially damaging the fabric. Everyone who has used the new all-metal pressed on ferrule agrees that it adds a great deal to the service life of Tuffy machine braided wire fabric slings.

Your Tuffy Distributor Can Save You Money

Tell him what your future requirements in Tuffy Slings and Tuffy Hoist Lines are likely to be. He'll tailor his stock for you to draw against. You'll save the time, space, and cost of maintaining your own inventory.

FACTS ON FERRULE, SLINGS, FITTINGS, IN FREE NEW TUFFY SLING HANDBOOK

This new 60-page Sling Handbook gives you complete information (charts and rated working loads) on a larger line of factory-fitted slings. It tells you how to use versatile Tuffy Slings on dozens of different jobs. It shows you how the new Tuffy metal ferrule is pressed on the eye splice to make Tuffy machine braided wire slings safer and faster to work, and it shows you the most advanced sling fittings available. On top of all this, it contains a brand new engineer's handbook and a valuable rigger's manual.

If you buy, use or specify slings—if you are concerned with shop safety, efficiency, and long service life—you need this fully illustrated, comprehensive Tuffy Sling Handbook. Mail the coupon to us now for your copy of the new edition. No obligation.

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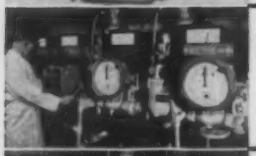
√ Are you saving all you can with Liquid Meters?

Here's a check-list of savings made every day with accurate metered measurement of more than 150 industrial liquids. Chances are *you* can use at least five of these ideas in *your* plant:

✓ **AUTOMATIC BATCH MIXING:** Meter liquids directly to tanks or kettles with Neptune Auto-Stops. Push buttons to set quantity . . . meter cuts off accurately, automatically. No waiting for weigh tanks to fill, no "inching" up to gauge marks, no wrestling with bags or buckets.

✓ **AUTOMATIC PROCESS CYCLING:** Auto-Stop meters can be equipped with electrical switches to start or stop pumps, agitators, etc. . . . automatically. Saves times, labor, power . . . with closer control.



✓ **ELIMINATE REJECTED BATCHES:** In one leading pharmaceutical plant, Neptune meters eliminated human errors, saved enough costly ingredients to pay for the meters in less than a month! How's *your* "reject" rate?

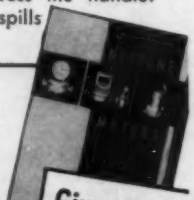
✓ **EASIER INVENTORY, COST CONTROL:** Neptune Meters at key check points keep track of inventory, interdepartmental use, production rates, etc. They put a stop to waste, verify full measure received or delivered.

✓ **AUTOMATIC DRUM FILLING:** This Neptune fills drums, radiators, fuel tanks, etc., with exact quantity every time you press the handle. Saves time, labor, prevents spills or "shorts."

✓ **OIL BURNERS, DIESELS:** Use these low-flow meters instead of bulky day tanks to measure fuel consumed by boilers, melting furnaces, diesels, etc.

✓ **WATER CONDITIONERS:** Trident meter's wary eye tells when ion exchange unit needs recycling. See if yours has trouble-free Trident.

✓ **TANK TRUCK DELIVERIES:** Many industrial liquids can be delivered by metered trucks with greater ease and accuracy than markers, gauges or sticks. Investigate Red Seal meters.



Give you any ideas?

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PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

Plastic tubs make good containers for collecting scrap, reducing contamination

chines' metal parts can drop into them.

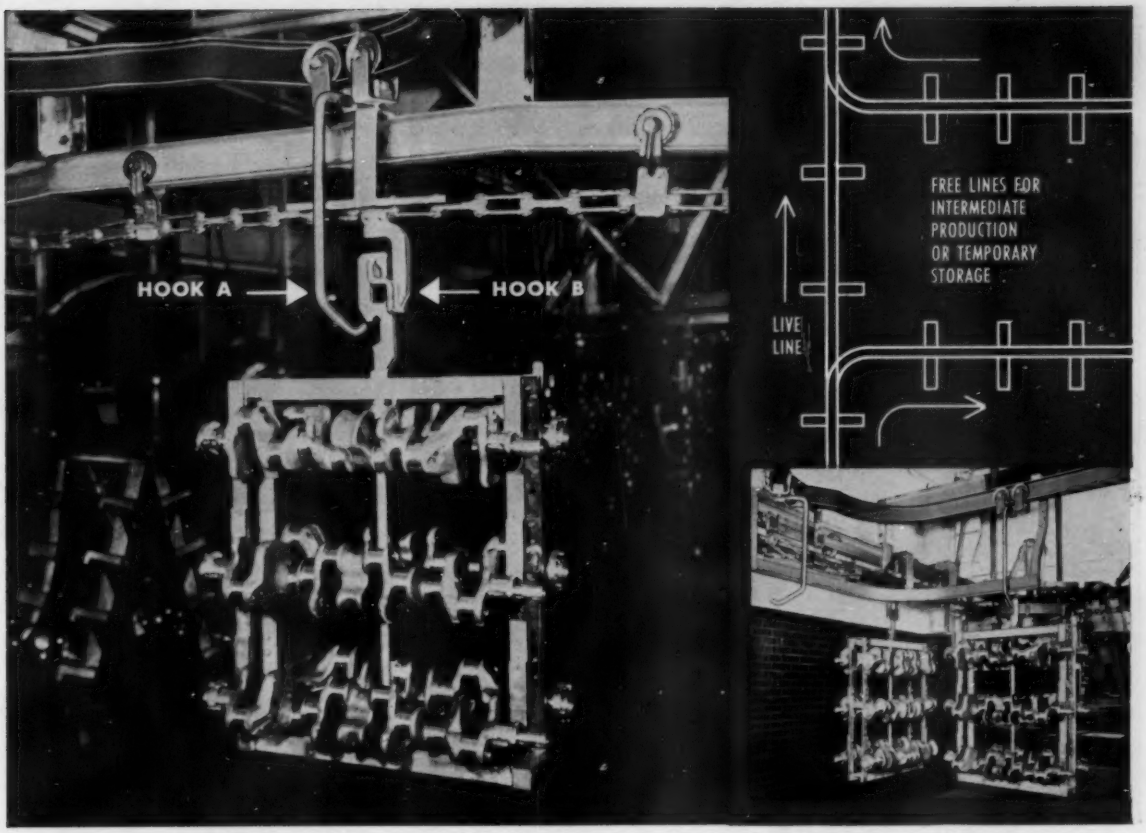
As several types of metal are processed during each day, the tubs are replaced at the end of a run of any particular metal and the scrap is deposited in its respective container.

This segregation of scrap has substantially reduced the handling of it, and has virtually eliminated scrap contamination. As a result, income from the sale of scrap has increased. *From a release of Federal Telephone and Radio Company, Div. of International Telephone and Telegraph Corporation, Clifton, N. J.*

TV Fire Watch

AROUND-the-clock fire watch is kept on 29 acres of roof at our Tank Plant in Cleveland, Ohio, by two remote-controlled television cameras. Each camera sweeps half the roof and oper-

Camera perches atop tower on plant roof



Unloading from the power line to the free line is accomplished simply and quickly when loading hook A engages with hook B automatically. Parts are engaged with the power line without danger of collision with incoming loads by simply reversing the disengaging principle.

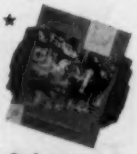
Now - completely trouble-free automatic transfer from live line to free with Allied Conveyors' TRANS-FREE Principle

Nearly every conveyor line requires, at some point, the transfer of racks or parts from a continuous power driven conveyor line to an auxiliary free line. In the past, this transfer could be accomplished only with a highly complicated system which was expensive to install and equally expensive to maintain.

Now, Allied Conveyors' Trans-Free (patent pending) can perform the job automatically at any point in the system without complicated electrical gadgets —with virtually no possibility of breakdown—and with practically no maintenance expense. This Allied Conveyors' installation automatically selects any given unit load and transfers it from a continuous power driven line to an auxiliary free line. These free lines can be located at any point adjacent to the live line where intermediate production operations are to be performed or inventory is to be temporarily stored. When the part is required, it is automatically transferred back to the live line. The system is entirely automatic and completely interlocked to prevent colliding of incoming and outgoing loads.

Trans-Free is one of the many reasons why more and more manufacturers are turning to Allied Conveyors for the kind of engineering ingenuity which will lower unit costs and speed production.

★ ★ ★



Whether your production needs involve modernization of present equipment or the design and engineering of an entire new conveyor system, you will find many useful ideas in this new booklet by Allied—*Conveyor Systems Case Histories*. Write for it today.

ALLIED CONVEYORS

ALLIED STEEL AND CONVEYORS
Division of the Sparks-Withington Co.
56-1 17351 Healy Avenue • Detroit 12, Michigan

For more facts circle 535 on Reply Card

Just a squeeze sets the fastening stud in steel or concrete!

THAT'S HOW SIMPLE IT IS—a flex of the finger—to anchor fixtures securely with the Remington Stud Driver. Off goes the power load, the stud is anchored into steel or concrete—straight as an arrow. No predrilling or outside power source required!

You can set both ¼" and ⅜" diameter studs with the Remington Stud Driver—up to 6 studs per minute either size. There are 40 different styles and lengths of Remington Studs to choose from. With this *one* tool, you can take on *every* stud-fastening job—light, medium and heavy-duty—and save time and money on every one of them! Get full details by mailing coupon below.

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STUD DRIVER

Industrial Sales Division PE-3
Remington Arms Company, Inc.
Bridgeport 2, Conn.

Please send me your free booklet which shows how I can speed my job and save with the Remington Stud Driver.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

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PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

Operator scans screens in control center

ates on automatic pan, moving constantly back and forth. Cameras are encased in weather-proof housings provided with "windshield" wipers.

Controls and television screens are located in the plant protection department. Should anything unusual appear on the roof, it will be shown on one of the monitoring screens. The operator can then stop the camera and "zoom" in on the object for close scrutiny. The controls also allow for tilting the cameras, manual pan and adjustment of focus. *From Cadillac Craftsman, published by Cadillac Motor Car Div., General Motors Corp., Cleveland, Ohio.*

Hot Dipped Bicycles

ABOUT 500 bicycles are used in the Humble Oil and Refining Company refinery, Houston, Tex., for transportation and messenger service. They are left out of doors at all times in a high humidity atmosphere where the

Galvanized bicycles cut maintenance

Nicholson *steam trap* capacity *gives you*...

faster, more effective condensate removal

Write, today, for your copy of new Bulletin 10-55—for detailed information.

Nicholson capacity is greater than that of any other trap of the same size. And, greater capacity—right across the board—means the Nicholson trap discharges condensate and air from plant steam lines and equipment *faster*, more *effectively*.

- **powerful valve action—big husky bellows.**
- **positive shut-off—finely ground valve and seat.**
- **high capacity—effective use of large orifice.**
- **each unit service tested—with steam.**

When less than the best won't do, specify Nicholson.

NICHOLSON

W. H. NICHOLSON and Company

TRAPS • VALVES • FLOATS • METAL PARTITIONS
LAUNDRY, DRY CLEANING AND PRESSING MACHINERY

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branch connections for any and all piping services

NOW AVAILABLE from leading warehousing distributors in all principal cities. Write for catalog W-4.

BONNEY FORGE & TOOL WORKS
WELDING FITTINGS DIVISION

For more facts circle 538 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

annual rainfall averages 50 in. As a result, they had to be dismantled and repainted yearly.

This maintenance has been eliminated by hot dip galvanizing the bicycles after dismantling them. The cost for each machine is less than for repainting; further painting for the life of the bicycles is not necessary and down time is cut to a minimum.

Since this procedure has been so successful, new motor scooters now being ordered by the refinery, are being supplied with all sheet metal parts galvanized. *From a release for The American Zinc Inst., New York, N. Y.*

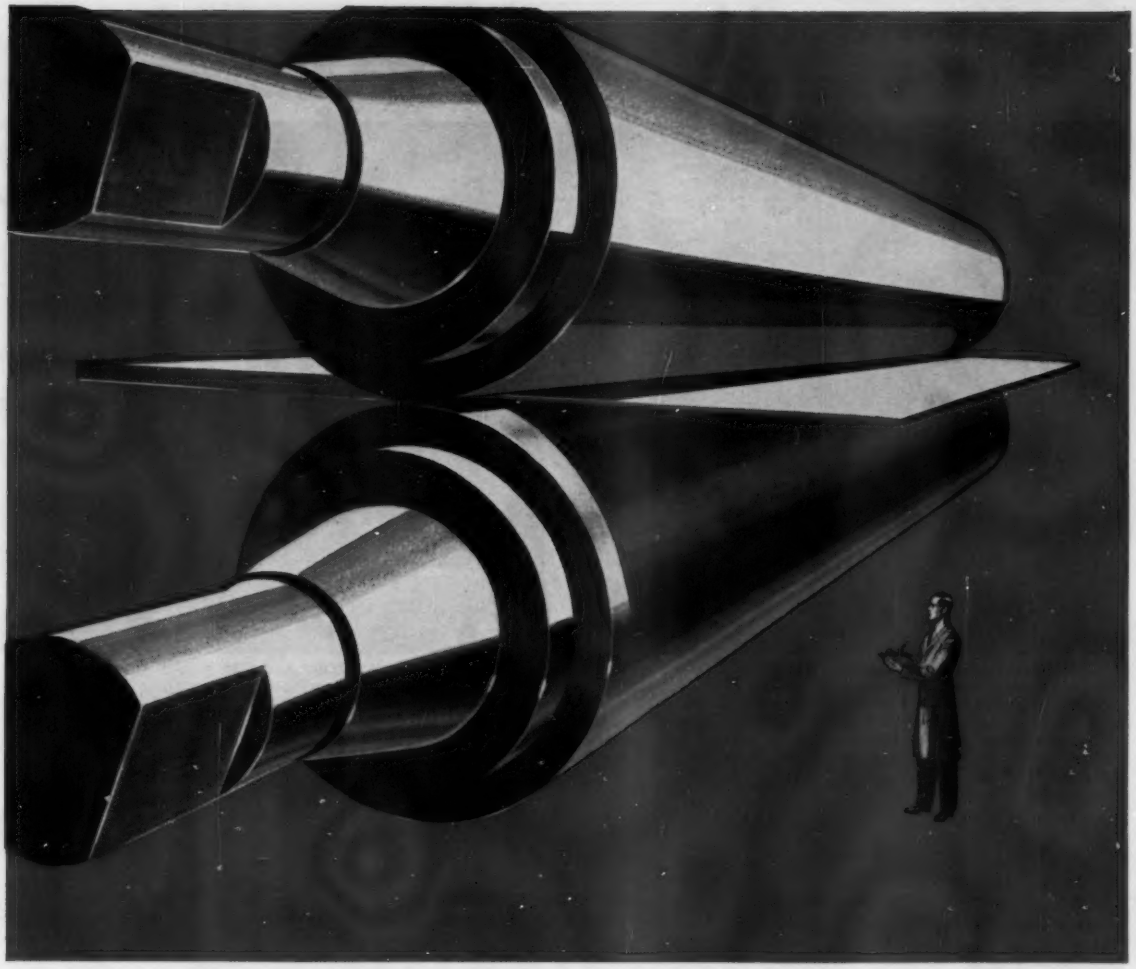
Pint-Size Bulldozer

Originally designed for use on home construction, this pint-sized version of the bulldozer is proving handy for moving bulk materials and similar jobs. (From a release of Aveling-Barford Limited, Grantham, Lincs., England)

'Ware Dinosaurs

THE BUSINESS of manufacturing and importing model dinosaurs has, until recently, been plagued with a problem in shipping.

Due to the fact that the models are made out of porcelain elaborate packaging precautions had to be taken to prevent breakage. The use of big red labels saying "Glass, Handle With Care" and "Fragile, Please Handle With Care" had but little power to appeal to Post Office and Express Company employees who are hardened by handling thousands of packages daily. Now, 3- by 5-in. labels saying, "FRAGILE — DINOSAURS — HANDLE WITH CARE," are used. It is expected that even the most case hardened package handler will treat a box labeled "Dinosaurs" with respect. *From a release of Abbeon Supply Company, Jamaica, N. Y.*



THE MAN WITH EXPERIENCE IN INDUSTRIAL LUBRICATION

Here's a man with experience, where experience counts, on-the-job experience in heavy industrial lubrication.

He's a man who is typical of Atlantic service. Selected to represent Atlantic because he *is* a specialist. And he's backed by other Atlantic specialists in lubrication research, production, quality control and transportation.

Atlantic has served customers successfully for 85 years because Atlantic has developed the products necessary to do the lubrication job right at the lowest cost to the lubricant consumer.

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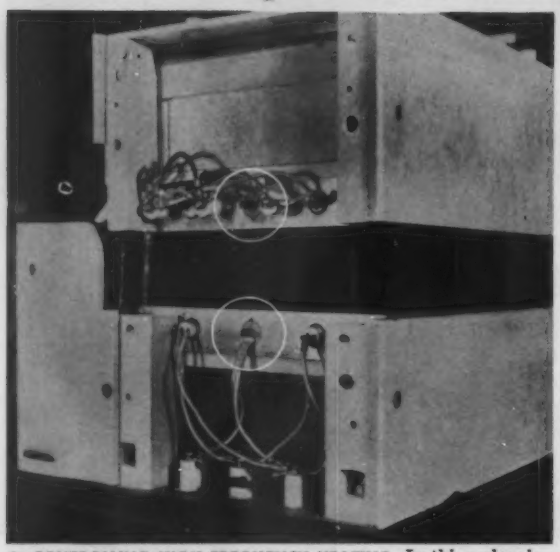
ATLANTIC

LUBRICANTS • WAXES
PROCESS PRODUCTS

For more facts circle 539 on Reply Card

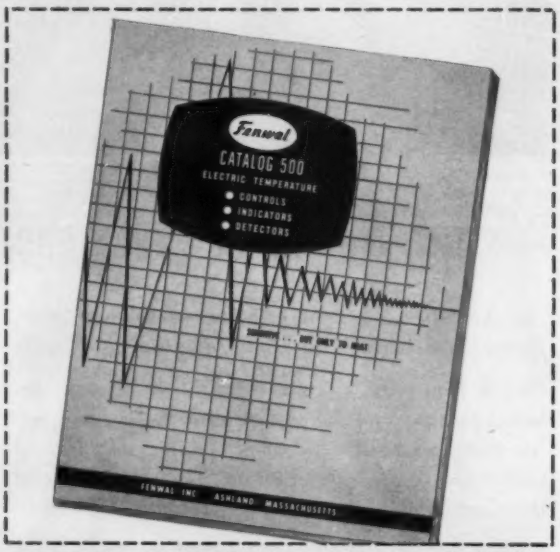
How would you solve these tricky temperature control problems?



1. CONTROLLING HIGH FREQUENCY HEATING. In this vulcanizing patch press, precise temperature control of the platens was required to prevent loss of electronic heat generated within the processed material. Fenwal's solution was two THERMOSWITCH® units, set at 400F, mounted on the platens. Result: a production rate of 3,000 patches per hour, compared to ordinary hot press methods of 30 per hour.

2. SAFETY IN A DISTILLING PROCESS called for a dependable failure alarm. A Fenwal THERMOSWITCH unit in the condenser's safety vent solved the problem. Now, should the cold water supply fail, steam blowing through the condenser tubes will hit the THERMOSWITCH unit. This control, set at 120F, will then open, shutting off the electric heaters and sounding a continuous alarm.

3. PROTECTING PRODUCTS. In this shoe lining smoother, the problem was twofold: to use the fewest possible thermostats; provide close temperature control in order to prevent burning of shoe leather. Fenwal's solution: a single adjustable THERMOSWITCH unit, mounted on one ironer and controlling two ironers. This halved the number of thermostats indicated, while providing precision temperature control.



4. SEND FOR NEW CATALOG, just off the press. It describes Fenwal's complete line of THERMOSWITCH units and new indicating controllers for industrial applications. Fenwal engineers are always glad to help on any of your temperature control problems. Write **Fenwal Incorporated, 393 Pleasant St., Ashland, Massachusetts.**

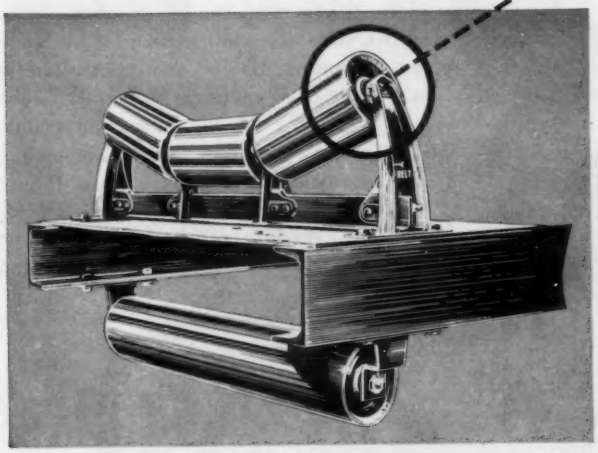
Fenwal **THERMOSWITCH®**

Controls Temperature — Precisely

For more facts circle 540 on Reply Card

For longer idler life . . . here's 3-WAY protection in ONE simple, compact cartridge seal

1. Labyrinth seal
2. Contact seal
3. Clearances Grease Filled



THE effectiveness of Link-Belt cartridge grease seals in protecting belt conveyor idler bearings is matched by no other in industry. Besides the normal high efficiency of Link-Belt's labyrinth and contact seals . . . grease within the labyrinth further prevents entry of dirt or other particles. This cartridge (see above cutaway) is one integral unit—no springs, no loose washers . . . no possibility of metal-to-metal contact. From shaft to shell—bearings, fittings, rolls, frames, even hex nuts are designed for long, trouble-free life.

Also important, you can always find the *right* idler in industry's most comprehensive line—over 500 idlers in 34 types, built in a broad range of roll diameters and belt widths with matching return idlers. Ask your Link-Belt sales representative or authorized stock-carrying distributor for 48-page Book 2416, which covers this broad line thoroughly.

LINK-BELT

BELT CONVEYOR IDLERS

LINK-BELT'S superior grease seal is standard throughout industry's most comprehensive idler line

Series 100 Idlers
Continuous service for all but heaviest and coarsest materials.

Series 200 Idlers
Continuous service for heaviest and coarsest materials.

Series 400 Idlers
Continuous service for maximum volume per lineal foot of belt.

Series 500 Idlers
For greater volume than series 100 at maximum economy.

Series 600 Idlers
For grain and similar materials requiring only light belts.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,808

For more facts circle 541 on Reply Card

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. . . enough to fill a train of boxcars 5½ miles long

One of the biggest air handling assignments on record — and Clarage all the way!

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Make sure *your* investment in air handling and conditioning is a profitable one. Investigate the equipment we have perfected for every type of application.

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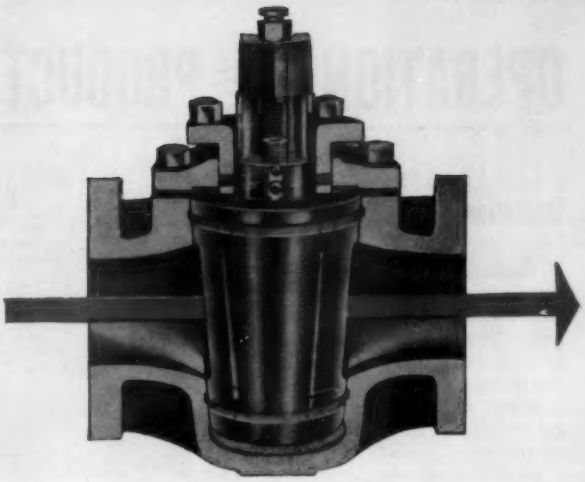
Straightway

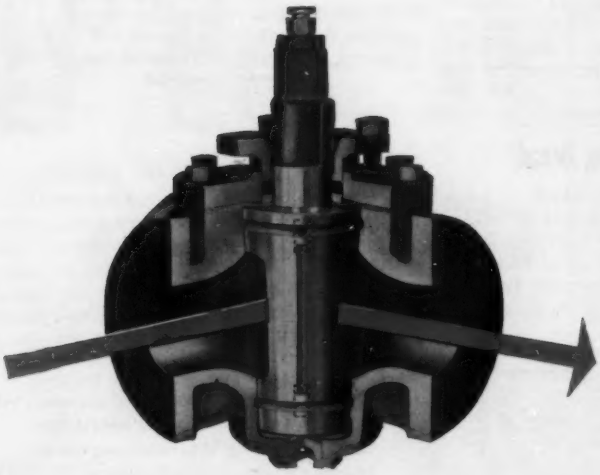
Leakproof Rockwell-Nordstrom Straightway valves cost you no more to buy and far less to use than any other valve. The exclusive Sealdport* lubrication system saves you important dollars in maintenance by eliminating the metal-to-metal friction that wears out other valves so quickly. Expensive seating problems are eliminated on even the toughest service because the Rockwell-Nordstrom valve seats are never *exposed* to the line fluid. Available in a complete range of sizes and pressure ratings in steel, semi-steel, stainless and other corrosion resisting metals.

*Registered trade mark, Rockwell Manufacturing Co.



Two ways to
Cut Your Valve Costs

ROCKWELL-Nordstrom Straightway and Multiport **VALVES**



Multiport

For such services as tank switching, relief, and blending, Rockwell-Nordstrom Multiport valves stop or change flow on three or four lines. You not only get perfect flow control but you save the cost of three or four ordinary valves . . . piping arrangements are simpler and less costly, too. Lubrication and unexposed seating assure lowest maintenance—longest service, just as in the Straightway pattern above. Rockwell-Nordstrom Multiport valves are available in semi-steel, steel, stainless and corrosion resisting metal in a wide range of pressure ratings and sizes to 16″. Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee:* Peacock Brothers Limited.

ROCKWELL-
Nordstrom
VALVES

Lubricant Sealed for Positive Shut-Off

40th YEAR *of lubricated plug valve leadership*

SEND COUPON FOR MORE DETAILS

ROCKWELL MANUFACTURING COMPANY
Pittsburgh 8, Pennsylvania

☐ Please send me Bulletin V-215.
☐ Please send me name of nearest Rockwell-Nordstrom industrial distributor.

Name_____ Title_____

Company_____

Street_____

City_____ Zone_____ State_____

For more facts circle 543 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

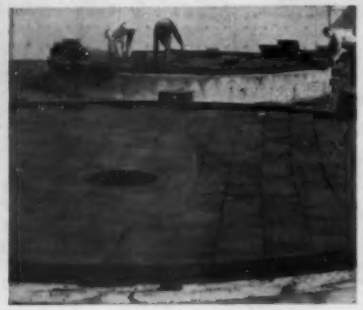
Insulation Carries the Load

CONSTRUCTION FEATURES of the Port of Seattle's new tank farm for non-petroleum oils include an "exterior coil" method of heating the tank contents. The $300,000 plant consists of 24 steel storage tanks varying in capacity from 25,000 gal to 210,000 gal, with total storage capacity of 2,453,000 gal of fish oils, tallow, tung oil, linseed oil and other vegetable oils.

To heat these oils for pumping, hot water coils were placed under the tanks, as opposed to the usual procedure of placing the coils in the tank. This method leaves the tank interiors free of obstructions, for easier cleaning but to prevent heat loss from the coils to the ground through the concrete foundation, it was necessary to insulate under the tanks.

The insulation chosen was Foamglas cellular glass, a product of the Pittsburgh Corning Corp. With compressive strength of 7 tons per sq ft, it can easily withstand the weight of the tank and contents. Also, its sealed cellular glass structure is impervious to moisture infiltration.

The insulation was applied over the concrete foundation slab, using hot asphalt as an adhesive. Roofing felt was mopped in place over the glass blocks. Hot water coils were then installed and covered with a concrete grout, and the tanks were put in place over the grout surface.



Workmen lay glass blocks over concrete slab on tank in rear. Insulated tank slab, foreground, is ready for felt cover

Board Keeps Inspection "Dates"

Contributed by H. S. Garceau Plant Engineer, Louisville Works, International Harvester Co.

IN A PLANT the size of ours, it is inconceivable that one person could inspect all of the many and varied pieces of equipment for which the plant engineer is responsible. Therefore, it is necessary that this equipment be catalogued for inspection and that responsible individuals are assigned to the maintenance work.

To accomplish this at our Louisville works we use a master control follow-up board. It has a series of numbered pockets on one side, each pocket containing a five inch by eight inch card bearing complete information for the maintenance of a specific piece of equipment. Where we have duplicate equipment, the pocket contains the appropriate number of cards.

Vertical rows of holes have been punched across the board, each vertical row identified by a monthly date. We move a pin horizontally across the board, to indicate the date that a specific piece of equipment is to receive maintenance service. When the date comes up, the card identifying the equipment is pulled from its pocket. The card lists the exact work and maintenance service to be done on all parts of the equipment, and also indicates the period of time before the next servicing is due.

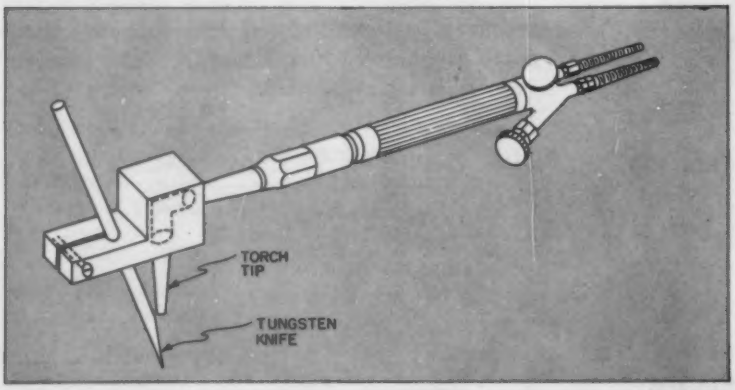
Spaces on the cards permit the servicing mechanic and his supervisor to place their initials, indicating completion of the work indicated on the card. When the work is completed and inspected, the card is returned to its

(Continued on page 54)

Hot Tungsten Knife Cuts Aluminum Plate "Like Slicing Bread"

HOT KNIFE CUTTING of aluminum is an innovation at the Boston Naval Shipyard, as reported in the Bureau of Ships Journal. The equipment consists of a standard oxyacetylene welding torch with a special tip that holds a tungsten knife blade and directs gas flow at right angles to the torch handle.

A multiple or single tip is arranged so that one or more flames impinge on the knife blade. Directed to the surface of the aluminum plate being cut, the same flame will preheat the aluminum for cutting.



Torch adapted for hot knife cutting. Special block holds knife and torch tip

When the torch is lit, the tungsten knife reaches white heat almost immediately. With the preheat flame heating the aluminum plate almost to the melting point, the hot blade can be drawn through the soft aluminum with ease. Naval shipyard employees who suggested the tool compare its action with that of a sharp knife cutting bread.

The hot cutting process eliminates shearing, punching and chipping in many applications. Straight, curved or sharp-cornered cuts can be made, and cuts can be started anywhere in the plate, not necessarily at the edge. With a single tip, the torch will cut plate up to ⅛-in. thick; for heavier plate, two flame tips are used.

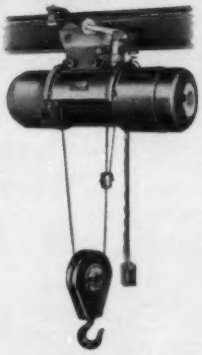
Because the hot knife process has a tendency to remove a good deal of the heat treatment when used with heat treated alloys, it is recommended that its use be restricted to non-heat treated aluminum and aluminum alloys.

For more facts circle 544 on Reply Card

ACCO products

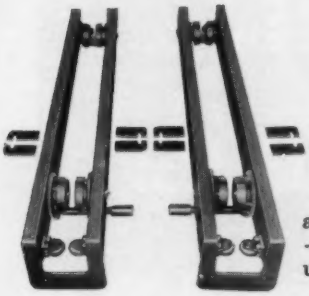
The WRIGHT Hoists for Dependability

3 TOP NOTCH UNITS FOR USE IN LOCAL-BUILT CRANES FOR BETTER JOB AT LOWER COST



SPEEDWAY ELECTRIC HOIST

Available in Frame 1, 1½, 2 and 3 sizes with capacities from ¼ ton to 10 tons.

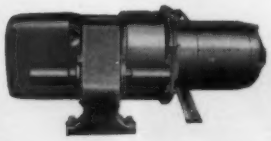


END TRUCKS FOR ALL TYPES

For motor-driven cranes and hand traveling cranes—both top running and under-hung types.

CRANE DRIVE UNIT

Designed for crane and double-beam trolley propulsion. Consists of an electric motor and a well-proportioned gear reduction. Size 1—with motors to 2 HP. Size 2—with 3 to 7½ HP motors.

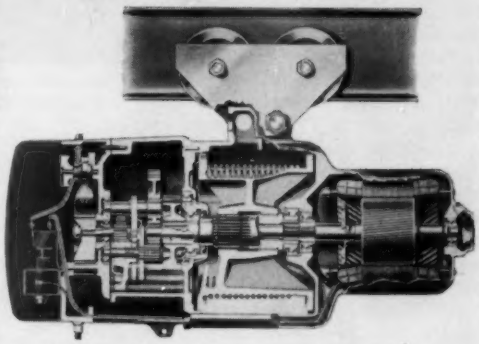


for complete information on WRIGHT Hoists and Crane components ask for:

Speedway Hoists: *(Frame 1) Booklet DH133B, (Frame 2 & 3) Catalog E55A* • ***Motor Driven Cranes:*** *Underhung, Single Bridge, Bulletin #227; Top Running, Bulletins #DH448 or DH449* • ***Crane Drive Units:*** *Booklet DH-431A* • ***Hand Traveling Cranes:*** *Bulletins #DH-469 and #DH-438A*

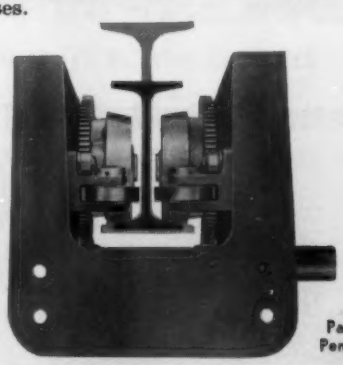
Write our YORK, PA., office

LOOK FOR THESE QUALITY FEATURES



Sound, generous, practical design

Heavy duty design and fine balance assure users that WRIGHT *Speedway* Hoists will handle tough jobs on any duty cycle for which 30-minute NEMA motors are satisfactory. Wide gear faces and novel gear form insure extreme strength. All gears and pinions are alloy steel, heat-treated. Their ductile core supplies shock resistance to sustain service stresses.



Patent Pending

New end trucks prevent running off or skewing

Illustration shows underhung single bridge end truck with flangeless wheels operating on the largest and smallest beam for the capacity of truck. Three trucks cover range of runway beam from 8″ to 24″. Note sturdy construction of guide wheels and how they are mounted below the wheel axles so as not to interfere with splice plates or other web constructions.

ACCO

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Better Value

OPERATION—PRODUCTION

(O and P begins on page 52)

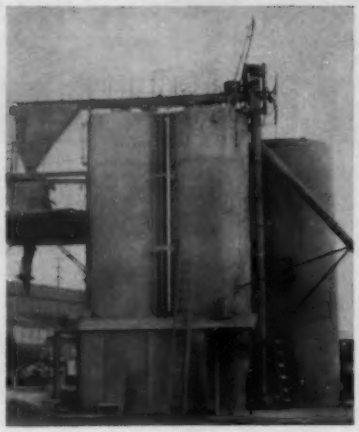
proper location and the date line is moved out to the next inspection.

This system has proved applicable for every type of maintenance service performed. Repairs and replacements of a minor nature are made during the inspection. Interior orders are written for work that cannot be done during the line of inspection.

Because the time element involved during this maintenance inspection has been previously determined, it is possible to make eight hour assignments for each mechanic by merely giving him enough pieces of equipment to inspect to fill his working day. While eliminating clerical help as well as mechanics' reports, the system also eliminates the possibility of overlooking some elements of the maintenance work required. We have found it to be the most satisfactory solution for overhead inspections, maintenance of cranes, furnaces, special electrical equipment as well as the simple jobs of such as maintaining roller conveyors and similar equipment.

Screw Conveyors Solve Cement Handling Woes

SCREW CONVEYORS are being installed to replace the elevators in the cement storage plants of the Oil Well Cementing Co., Downey, Calif. The change is the result of the performance of the company's first screw conveyor installation, which has been operating for three years. This system, designed by the Fort Worth Steel & Machinery Co., is made up of Fort Worth components.



Cement storage tanks, with screw conveyor system for loading and unloading

Among the advantages of the screw conveyor plant is one especially important because of the Los Angeles area smog situation—cement dust control. Another advantage, according to a company spokesman, is that the original installation cost of the vertical screw elevator in the Downey plant was only about half what a bucket elevator system would have cost.

The plant has a 45-ft vertical screw elevator which operates in conjunction with two horizontal screw conveyors. The bottom horizontal conveyor (32 ft) serves as a feeder to the vertical elevator. The top horizontal conveyor (28 ft) distributes the cement to any of the three cement storage tanks, or to a truck.

A trucker bringing a load of cement for storage drives onto a ramp and discharges his load into a hopper under the ramp, which empties into the feeder conveyor. This cement is moved by the feeder conveyor to the vertical screw, for delivery to the top of the storage tanks. At normal operating speeds, the screw conveyor system moves 20 sacks (1800 lb) of cement a minute.

The top horizontal screw and the vertical elevator are driven through the elevator gear head unit, and the lower screw is powered through a speed reducer.

Ultrasonics Impregnate Insulation

ULTRASONICS have been successfully used to speed up the process of making electrical insulation. Tests at General Electric's General Engineering Laboratory show ultrasonic treatment of a typical material to be 10 times faster than treatment by normal methods. Although not yet economically feasible on a broad scale, the new technique may lead to significant cost reductions in treating materials used in electrical insulation.

Under the new impregnation technique, semi-porous materials such as paper and cloth are treated speedily for insulation purposes. This requires replacing the air and water content

(Continued on page 56)

Martin Aircraft Tooling—Small Ideas That Pay Off Big

Combination tool developed at Martin Aircraft, Baltimore, drills holes and removes aluminum cladding from duralumin in a single operation. Consisting of a drill attached to a standard wire brush, the tool facilitates positive electrical connections in aircraft structures

Portable pneumatic hand-router, fitted with a half-inch milling cutter, cuts half-inch-thick wing skins at Martin. Adjustable guide, clamped to routing head is held against trim-template by operator to trim aluminum skin rapidly with an accurate, machine-finish trim

Solid carbide cutter has been developed by Martin for routing panel cutouts from panels made of laminations of various materials. Combinations of materials such as metal honeycomb, phenolic filler, fiber glass and dural are successfully routed. Tool lasts 500 cuts

Provides plenty of power where it's needed

National Electric Busways are designed to meet today's industrial requirements, yet provide capacity for future expansion.

Streamlined, compact, they're designed to permit the most economical, convenient, flexible and salvable layout possible.

NE "Lo-Loss" Feeder Busway

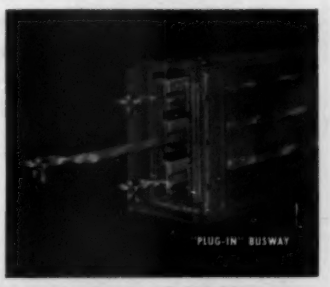
- Designed for current transmission up to 4000 amperes at 600 volts or less.
- Easy to install because single bolt connectors are used to join sections. Joints are silver-plated.
- Compact—Requires only 50% of the area needed for conduit and cable installations.
- On vertical installations, exclusive self-contained insulator support frame carries entire weight of bus bars independent of housing.
- Simple, accessible bolted connections which allow for quick and easy installation.
- Bus bars insulated with Fibron plastic tape. High dielectric strength and heat resistance.

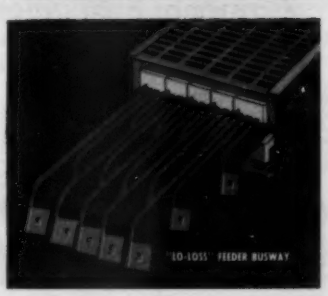
NE "Plug-In" Busway

- Rolled edge copper bus bars.
- All bus bar ends are silver-plated.
- Simplified, sliding type "plug-in" opening doors. No removable parts or springs.
- Natural gray finish baked to a hard surface inside and out.
- Insulators supported in a sturdy 12 gauge steel channel frame withstand rough handling during shipment.

For remodeling or new construction of commercial or industrial buildings, you'll find it will pay you to send for complete information on NE Busways today.

Listed by Underwriters' Laboratories, Inc.





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KENNEDY presents the *NEW* Look in Bronze Gate Valves

Fig. 427
Standard 125-lb. S.W.P. Bronze Gate, Non-Rising Stem, Inside Screw, Wedge Disc, Screwed Ends.

Fig. 427BS
Standard 125-lb. S.W.P Bronze Gate, Non-Rising Stem, Inside Screw, Wedge Disc, Brazing Socket Ends.

Fig. 427SJ
Standard 125-lb. S.W.P. Bronze Gate, Non-Rising Stem, Inside Screw, Wedge Disc, Solder Joint Ends.

KENNEDY'S *NEW* Cylindrical Design Means Greater Body Strength, Far Longer Leakproof Valve Life!

RUGGED BODY DESIGN . . . assures superior resistance to distortion as proven in high pressure steel valve design; Kennedy's grueling Accelerated-Wear tests conclusively prove this construction guarantees more than 10 times longer leakproof operating life than oval-body valves. Increased weight assures greater durability and longer valve life.

KENALLOY STEM . . . a special Kennedy stem material of silicon bronze with high tensile strength, accurately machined for ease of operation. The bronze alloy prevents seizing or galling and is entirely free from any tendency to dezincify.

PISTOL-GRIP HANDWHEEL . . . non-heating malleable iron, provides firm, easy three-way grip on top, sides and bottom. Indented rim notches top, side and bottom eliminate slip even with greasy gloves.

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OPERATION—PRODUCTION

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of the material with an insulating liquid such as varnish, resin or asphalt.

Sound waves are beamed through the insulating liquid and the material to be treated is dipped into the liquid in the path of the sound wave. The sound beam agitates the liquid with a motion that changes the direction of the liquid's particles a million times each second.

The ultrasonic process can be applied to the material in bulk quantity, or in some cases, after the material has been assembled into an electrical unit. It can also be used in treating materials such as laminar plastics. Impregnation also offers an advantage in mechanical strength, and in isolating a possible source of noise. However, further improvements are necessary to make ultrasonics impregnation economically practical in the automatic processing of insulation materials, according to a GE spokesman.

Portable Floodlighting for Refinery

Portable floodlighting equipment used at Sohio Petroleum Company, Covington, Kentucky, provides safe,

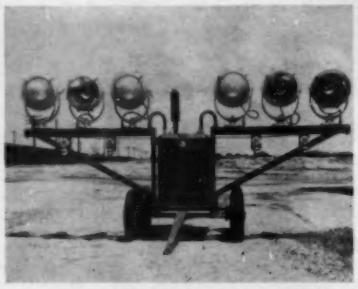

Fig. 1. For emergency and outdoor maintenance work in non-hazardous areas, generator mounts floodlights

adequate lighting during cleaning or repair operations of storage tanks and structural equipment. Two portable floodlighting setups have been designed by T. L. Clift, Electrical and Instrument Engineer at the refinery.

For emergency lighting and as a source of illumination for general outdoor maintenance work, Sohio employs a 7.5-kw portable generator equipped with six Crouse-Hinds non-explosion-proof floodlights. Three are wide-beam units, three narrow beam. Three floodlights on each side of the generator are mounted on wing girders. Positioning the portable power unit between unit refinery tanks, with the

why trust the unknown?

Why take chances with unknown makes of slings in your operations? There is too much at stake—the safety of workers plus the possible loss of valuable equipment, materials and working time.

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Tannate® packings . . .

seal properly—give longer life for nationally known alloy metal producer

Problem: A Nationally known Alloy Metal producer was not satisfied with their general maintenance packing performance. Lack of engineering service, inadequate performance and the fact that previous packings used required additional lubrication accounted for many packing problems.

Solution: Rhoads Sales Engineer suggested the use of Rhoads Packing Data Sheets for complete packing specifications and to assure correct packing construction. He also made helpful suggestions for the installation and maintenance of Rhoads leather packings in this company's many hydraulic and pneumatic installations.

Results: Through the use of Rhoads Tannate Leather Packings, proper sealing and longer life was obtained; down time was cut and delivery was expedited for their emergency requirements.

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OPERATION—PRODUCTION

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Fig. 2. Portable explosion-proof floodlights illuminate the interior of refinery tank during the cleaning operations

wing girders in a closed position, lighting is provided for two maintenance crews. Swinging the girders out a full 90 deg, a lighting bay is formed that delivers 35 ft candles of light to an object 50 ft away.

The generator also is equipped with four explosion-proof plug receptacles to feed power to other electrical equipment at the refinery, such as the battery of four explosion-proof floodlights used during cleaning operations inside refinery tanks.

Refinery tanks contain crude oil and refined petroleum products. Ranging in size from 20 to 100 ft in diameter and from 20 to 50 ft high, the tanks are regularly cleaned, inspected and repaired.

Ordinary floodlights are not used, because a volatile air-solvent mixture is still present in the tanks after emptying but before cleaning. Explosion-proof floodlights provide safe illumination during these maintenance operations. The cast aluminum fixtures are mounted on an aluminum tubing tripod that support the floodlight 5½ ft above the ground when retracted and 10 ft when extended. Power to the floodlights is fed by cable from the portable generator through a manhole in the top of the tank.

Gravity "Powers" Stock Rack

NINE 60-FT BAYS of inclined storage racks in its new distribution and steel storage building have reduced by 50 per cent the aisle space required per "front", and improved shipping flow for Holo-Krome Screw Corp., hexagonal socket screw manufacturers, Hartford, Conn.

Gravity does the work in the system, in which cases of pre-packed hex-socket screws are sorted on inclined runners. When an order-picker removes the case he wants from the rack

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OPERATION—PRODUCTION

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View down a stock picking aisle shows availability of boxes for stock picking

front, the cases behind slide down into front position, ready for picking.

Loading the Pick-A-Case racks from behind, and picking from the front steps up traffic, since feeding and picking aisles function independently.

Each 60-ft rack bay holds about 540 items. The installation provides 1085 fronts, and cost about $15,000. It was designed, fabricated and installed by Artco Corp., Flourtown, Penna.

Lamps Heat Tool Spindles

AT THEIR NEW engine plant in Detroit, technicians of the Plymouth Div. of Chrysler Corp, found that a loss of production occurred during each initial shift hour in the finish boring of cam and crankshaft main bearing holes in the Plymouth V-8 engine.

Four heat lamps heat boring spindles to maintain constant temperature. Pyrometer check shows 110 F temperature

Bored to the close tolerance of 0.0005 in., the holes were gaging too small. Reasoning that the variance was due to the lag between starting up the machine and its reaching "operat-

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Rockbestos VC tapes are made to our own exacting specifications which incorporate all the requirements called for in all IPCEA Standards.

PLUS

- A special surface treatment applied to insure that the tape will wrap properly to provide uniform dielectric strength and good bending characteristics in the completed cable.
- More rigid tape thickness requirements to insure uniformity of cable diameters.
- Rockbestos special Surface Hardness Test, not found in industry standards, insures varnish film that will not become damaged in processing or handling which the cable may get in service.
- Controlled methods of application of tapes avoid overstress of tapes assuring uniform dielectric insulation throughout the entire length of the cable.
- Add to this thirty years of know-how in the application of VC tapes for high temperature application on Rockbestos AVC cables and you have a VC cable that insures trouble-free operation and long life.

Rockbestos Braided *Varnished-Cambric* cables are stocked in 600 volt and 5,000 volt ratings for *immediate delivery*.

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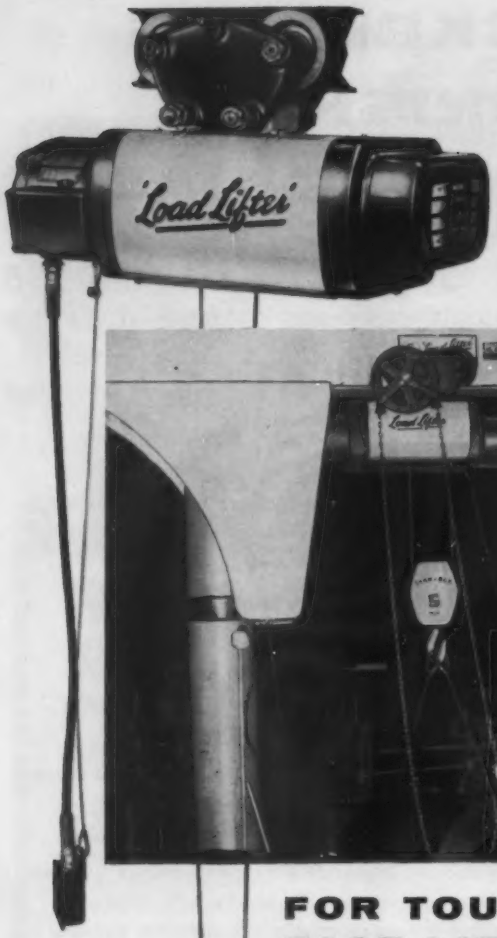

BUILT TOUGH

FOR TOUGH, FAST LIFTING

Today's tight production schedules demand hoisting equipment that will stand up under daily heavy-duty cycling without attention. This is exactly the performance you get from a Series "700" 'Load Lifter' Electric Hoist. Even though simply designed and constructed for easy maintenance *in the air*, your serviceman will seldom open the covers of this hoist. It is built to step up lifts per hour and step down the cost per lift in your plant.

The Series "700" 'Load Lifter' Electric Hoist was first with safe 24 volts at the pendant control. Capacities now range up to 15 tons. Single and two-speed models. All types of suspension. Ask your "Shaw-Box" Distributor for details or write for Bulletin 410.

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Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' and 'American-Microsen' Industrial Instruments, and Aircraft Products.

For more facts circle 552 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 52)

ing" temperature, the engineers installed heat lamps three feet above the boring spindles to keep them at a temperature comparable to that of the production line engine blocks.

As a result, it has been found that all finish cam and crankshaft bearings are measuring to tolerance.

Field Office Moves With the Job

FIELD OFFICES and other temporary structures required in a large construction project can become a costly factor in the overhead burden, if they serve only a one-time use. But experience in power plant construction in the Detroit area has recently shown that when such buildings are properly selected and planned, they can be a sound investment in flexibility of location.

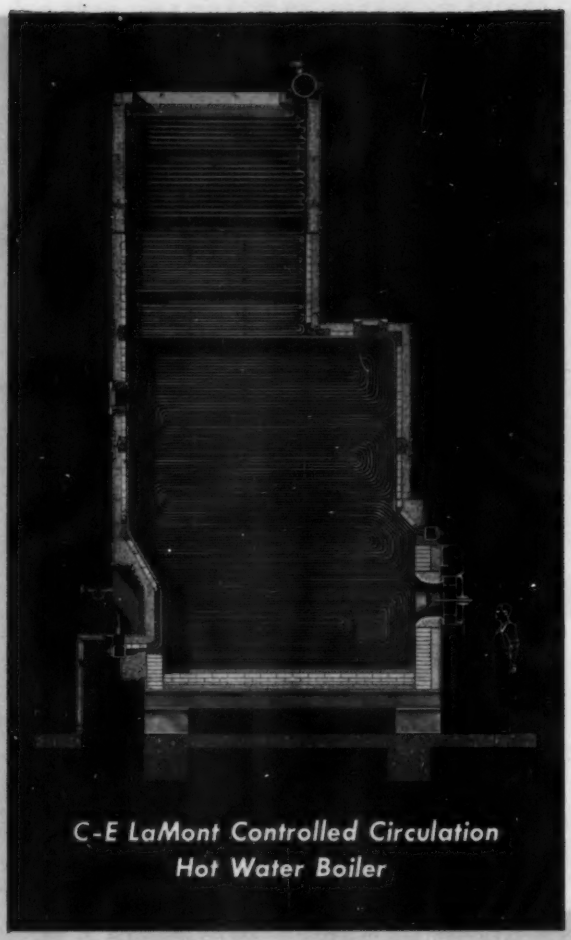
Photograph: Armco Drainage & Metal Products, Inc.
Field office moves and grows with the job, adds new 30-ft section at far left

When work was started in 1950 for the new St. Clair Power Plant by United Engineers and Contractors, prime contractors for the Detroit Edison Company, a Steelox (steel-paneled) building, 36 ft by 120 ft, was purchased for the use of engineers, timekeepers and personnel of Detroit Edison.

Following completion of permanent offices in the power plant, the steel building was disassembled and moved some 60 miles to the site of the new River Rouge Power Plant. Here it served as a company field office again.

Since the River Rouge plant is to be considerably larger than the St. Clair project, it became necessary to add an additional Steelox building unit, 36 ft by 100 ft. To meet the site requirements and convenience of use, the new structure was joined to the original unit at a 90 deg angle.

The steel-paneled buildings offered a third stage of flexibility when the requirements for field office space outgrew the capacity of the first two units. The need was met by adding a 30-ft section to the original building.



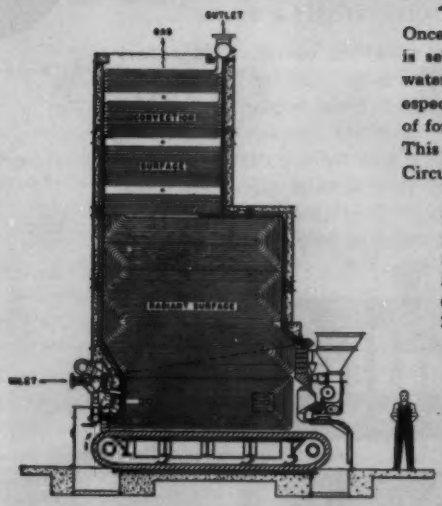
C-E LaMont Controlled Circulation
Hot Water Boiler

EVER CONSIDER HIGH TEMPERATURE WATER FOR YOUR HEATING AND PROCESSING NEEDS?

Both steam and high temperature water have their place, and your particular requirements will determine which is best for you. In either case, the complete C-E line includes a type and size of boiler exactly suited to your needs. Where high temperature (HT) water seems indicated, it affords such important advantages as:

1. The higher available heat in HT water — many times that of steam at the same pressure.
2. Closer control of temperature.
3. Heat loss is lower with the HT water closed system . . . unused heat returns to the boiler . . . no condensate return lines.
4. No elaborate feedwater treatment required. Make-up requirements are exceptionally low.
5. Steam traps not required — trap problems and attendant expense are eliminated.
6. No blowdown losses . . . no safety valve vent losses . . . no condensate losses.

The planning of any new heating and/or processing system should include the consideration of a high temperature water system. There are many hundreds of HT water installations operating abroad and a rapidly growing number in the U.S.A. It may be *just right* for *your* requirements.



Advantages of the C-E "HT" Water Boiler

Once it is established that HT water is right for your needs, your next concern is selection of proper equipment. The C-E high pressure, high temperature water boiler has inherent advantages that make it the best possible choice. It is especially designed for HT water applications utilizing as it does the principle of forced, controlled circulation which is extended throughout the entire sytsem. This accounts for numerous points of superiority in the C-E LaMont Controlled Circulation Hot Water Boiler. Among these are:

1. Complete control over HT water movement in both system and boiler.
2. No separate boiler pump is required, since low pressure loss is inherent.
3. Pressurized operation with oil or gas means no induced draft fan.
4. Single-pass design — no baffles — means cleaner boiler and lower draft loss.
5. More efficient heating surface can be arranged because of controlled, positive circulation.
6. Any fuel — oil, gas, coal, or any combination of fuels.
7. Other features such as: gastight, welded steel casing . . . fewer headers, all of which are accessible.

The C-E LaMont Controlled Circulation Hot Water Boiler is available in sizes ranging from 10 to 200-million Btu per hour, or more, with pressures up to 500 psi and temperatures to 475 F — higher if required.

If you are in the market for a heating or process system — or expect to be — by all means investigate high temperature water and the C-E "HT" Water Boiler. Our engineers will be pleased to discuss the subject with you or your consultants. Write for our new catalog HT-122.

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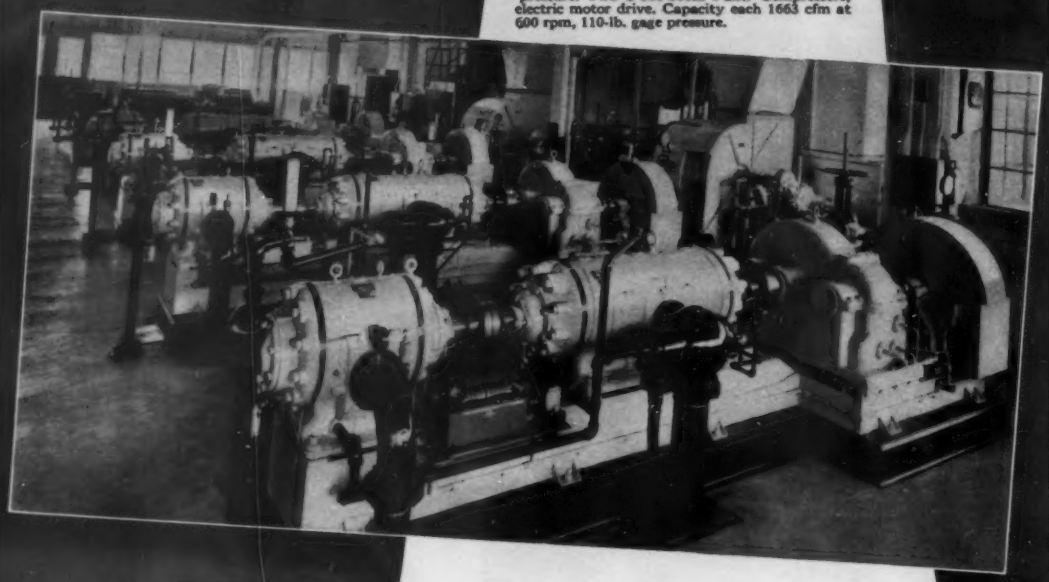

Four C-300-300H Fuller Compressors, steam turbine drive. Capacity each 1248 to 1805 cfm with a corresponding speed range of 450 to 650 rpm; one 125 and three 110-lb. gage pressure. Two C-300-300H Fuller Compressors, electric motor drive. Capacity each 1663 cfm at 600 rpm, 110-lb. gage pressure.

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Aircraft companies use a lot of compressed air in the manufacture of airframes, engines, systems and components. The battery of six Fuller compressors pictured above meets one important aircraft facility's entire diversity of compressed air needs, efficiently and economically.

The key to Fuller's smoother operation is *rotary motion*, which provides large capacity in relation to size, simple direct drive from motor or internal combustion engine, minimum number of working parts, one-way air flow free from pulsation, lack of vibration, continuous service with minimum supervision and maintenance. Operation in cramped quarters or on ordinary flooring is simple and practicable.

Fuller Rotary Compressors are built for capacities to 3300 c.f.m., 125-lb. pressure. Write for Bulletin C-5A, illustrating and describing these machines.

Fuller

. . . pioneers in harnessing AIR

C-274
1776

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Backward to Forward!

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gives 63% faster lubricant transfer

...saves right down the line!

The *real cost* of plant lubrication is not just the *lubricant* alone! Actually, it's the time and labor needed to get the lubricant *out* of the original drum—*into* a bucket pump or powergun—and then *applying* it to machine bearings. That's where the real costs add up!

And that's why an Alemite Air-Operated Transfer Pump can cut costs in your plant—especially if you are using old-fashioned hand methods of lubrication. It transfers 37 pounds of pressure gun grease *per minute*—direct from the original drum—completely sealing the lubricant at all times—protecting against mess, waste and contamination.

It's fast—and versatile! It can even handle alcohol, cutting oils, kerosene—almost any non-corrosive non-abrasive fluid you use by the drum. Delivers light fluids at a rate of up to 15 gallons per minute!

There's no better way to speed up your handling of lubricants—because an Alemite Transfer Pump pays for itself by saving man-hours and machine-hours as well!

- A 400-pound barrel of lubricant arrives at the plant—sealed, fresh, "refinery clean."
- An Alemite Transfer Pump is inserted in the bung-hole. It is threaded to fit—completely reseals the barrel.
- In less than a minute a 25-pound bucket pump is filled! No contamination, no air pockets, no mess or waste!
- Now the bucket pump is ready to service hundreds of hungry bearings with lubricant that is protected all the way from barrel to bearing!

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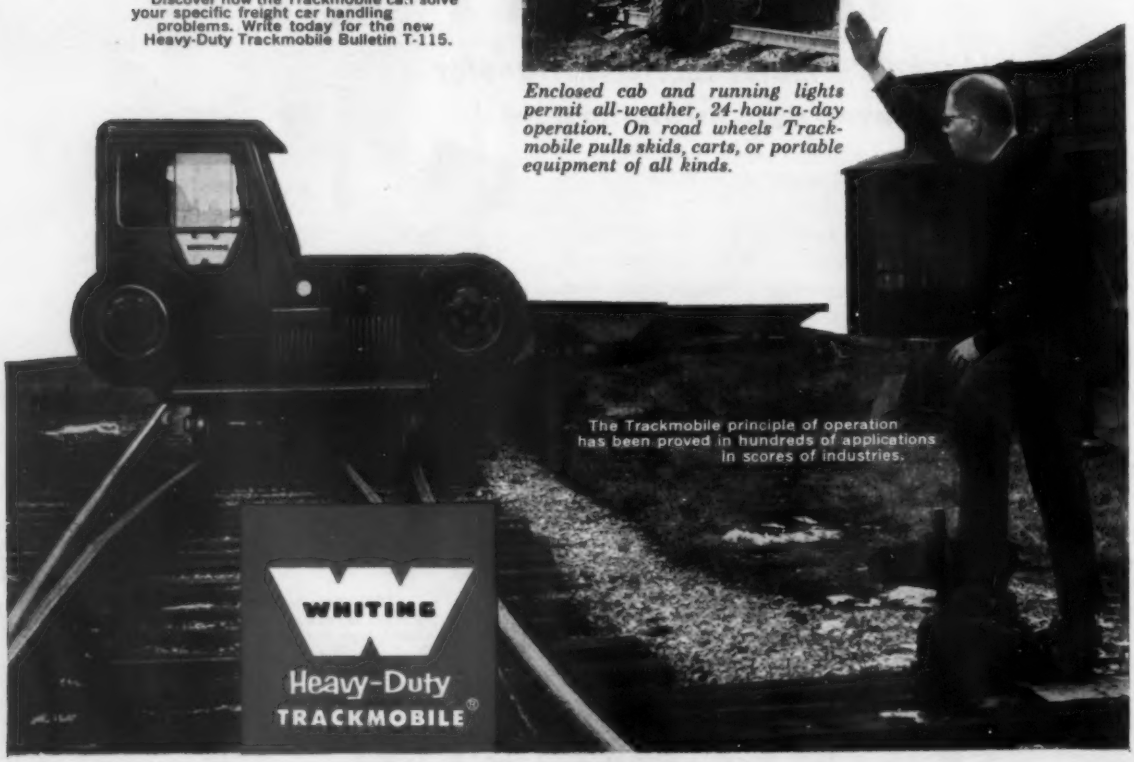
Discover how the Trackmobile can solve your specific freight car handling problems. Write today for the new Heavy-Duty Trackmobile Bulletin T-115.

Enclosed cab and running lights permit all-weather, 24-hour-a-day operation. On road wheels Trackmobile pulls skids, carts, or portable equipment of all kinds.



The Trackmobile principle of operation has been proved in hundreds of applications in scores of industries.

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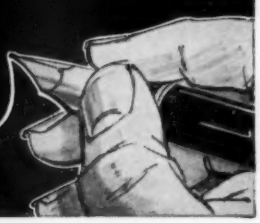

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No "bugs" to be worked out—*you're sure of perfect performance always* because every AIRTEMP job is backed by 21 years of advanced engineering by *Chrysler*. Whether your needs are large or small, the complete AIRTEMP line will meet your every requirement.

In determining the *one best* system for any building, in planning the layout and in the actual installation . . . you can count on expert guidance from top engineers of Airtemp Construction Corporation. And to *guarantee* your installations during the years to come, the nation-wide network of AIRTEMP personnel provides dependable service in every major community.

As the years go by, your clients will have tangible evidence of your wisdom in specifying AIRTEMP. They will appreciate particularly the low operating costs that result from modern, efficient design.

For full information on how AIRTEMP can meet all of *your* air conditioning needs, write: Airtemp Construction Corp., Dayton 1, Ohio.

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THE *FORWARD* LOOK IN AIR CONDITIONING

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Dallas, Texas. Air conditioned in 1938. Architects and Engineers: Lang & Weichel.

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March, 1956

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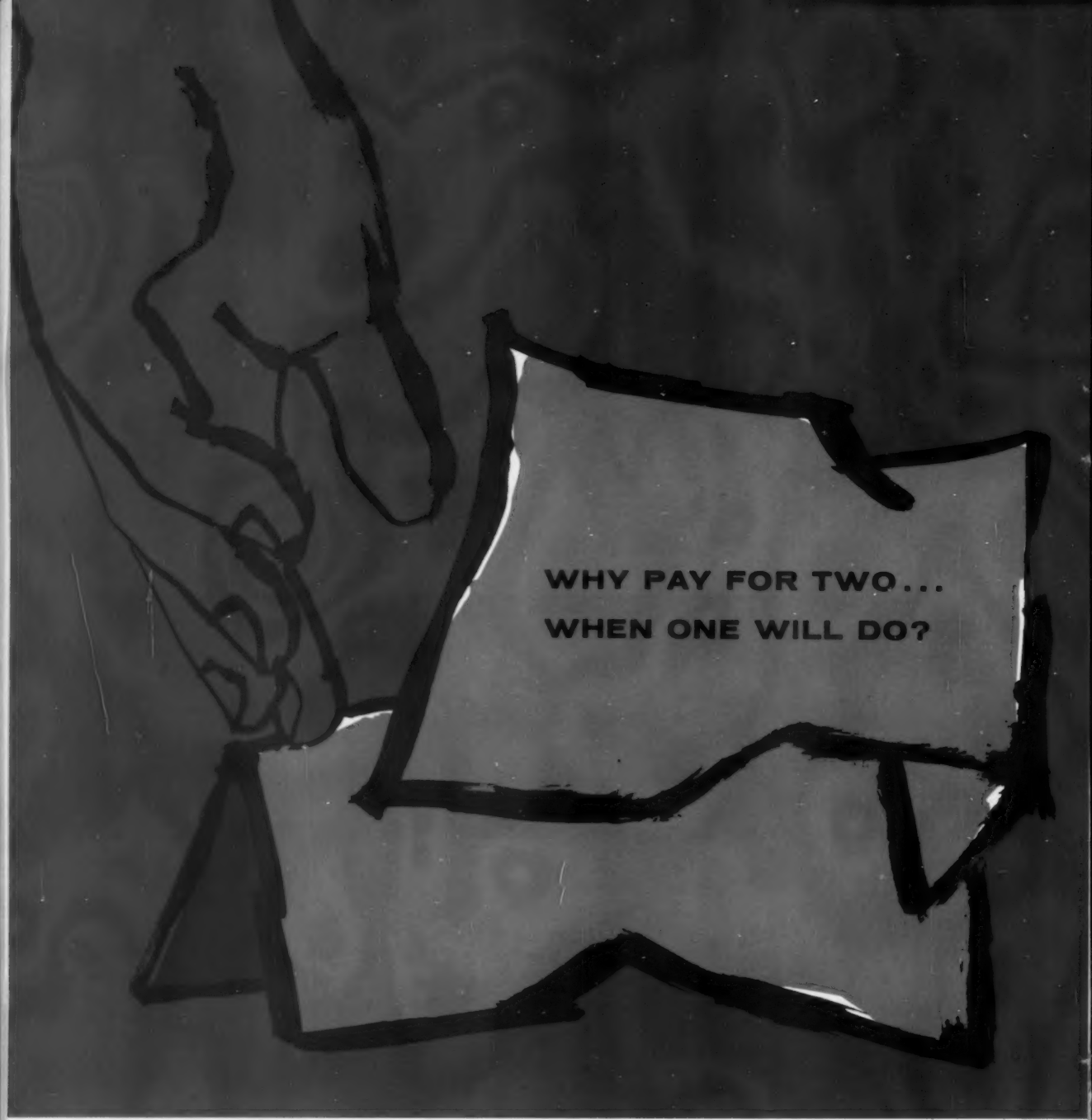
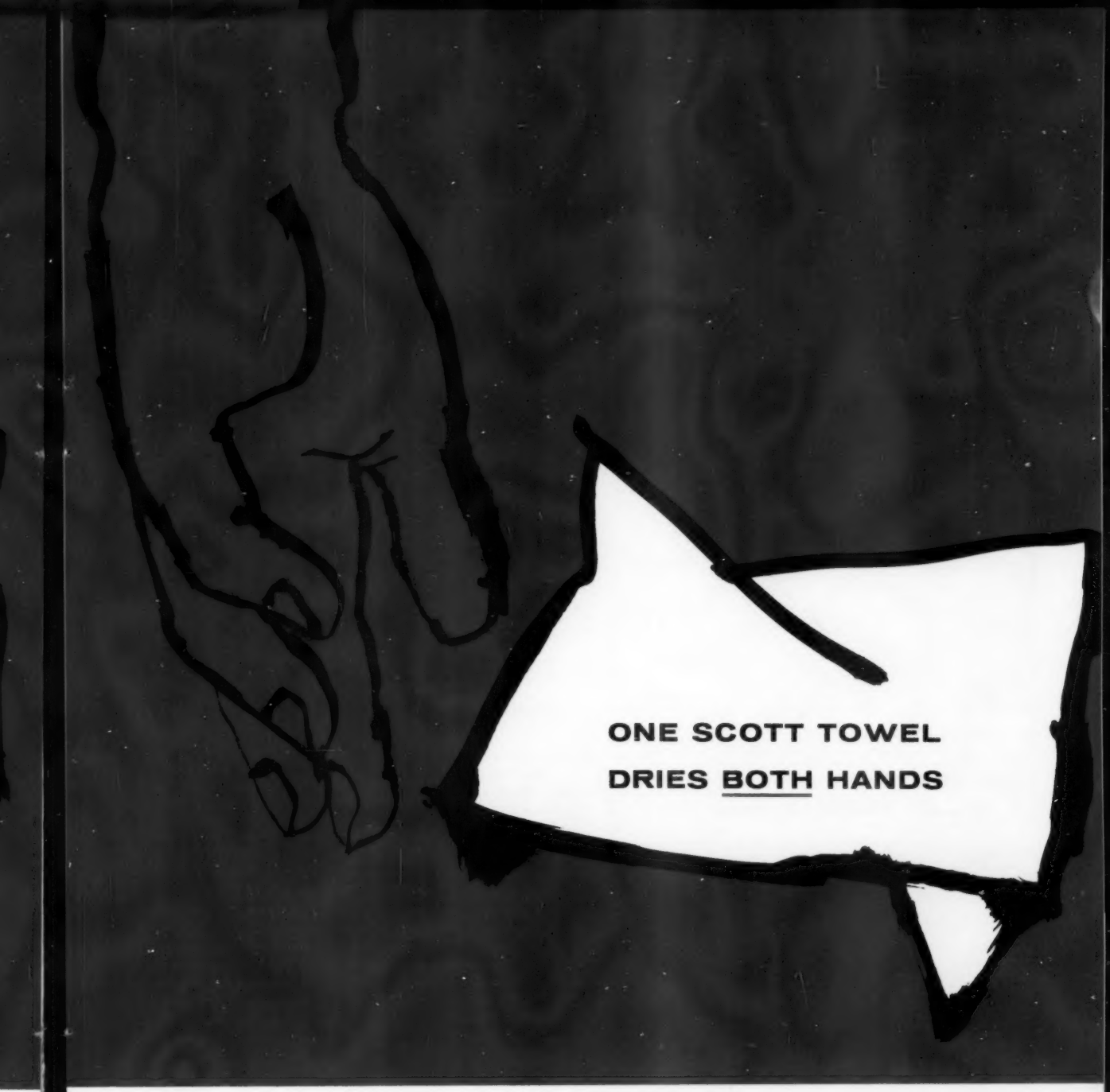


Fist test helps you see why Scott Towels cut towel consumption

Try this: Put your fist into a Scott Towel, see how it stretches and conforms to your hand—the drying surface comes into play instantly. This makes for thorough drying. The result: one Scott Towel is used instead of two or more.



Inferior towels go to pieces when they're wet. It takes two, three—a fistful to dry both hands. Consequently, consumption is high, cost is high.

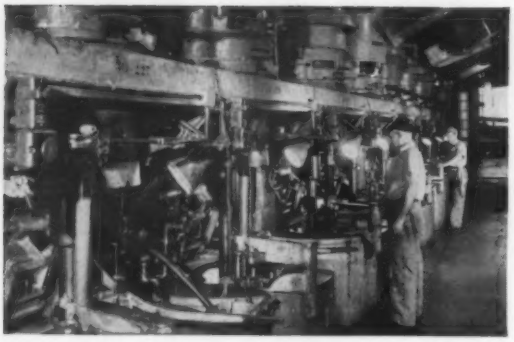
Not so with the quality Scott Towel. It's been designed for whiteness, softness—and most of all—absorbency. One Scott Towel dries two hands quickly and comfortably. There's no extra consumption, no extra washroom maintenance—cost is at a minimum.

Scott is the brand of towel your people buy for home more often than any other brand.

Give your local Scott representative or distributor a call today. Let him show you how you can determine the cost-reducing possibilities of Scott Towels in your washrooms.

Another quality product of the

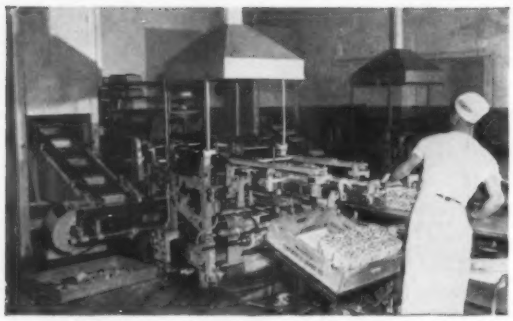
SCOTT PAPER COMPANY



Protecting syrup against carmelizing *at American Molasses Co. is the responsibility of Honeywell temperature and pressure controllers working with a* ***Modutrol*** *valve. The controllers are interlocked so that burning in the heater is prevented, and product quality is safeguarded.*

Honeywell Controller Cost—$215.00

Honeywell Industrial Controls



Air-conditioning bread as it cools *helps the Continental Baking Co., Portland, Oregon, to protect palatability. Honeywell Proportioning Temperature Controllers and Humidistat regulate sprays and air dampers to keep conditions right.*

Honeywell Controller Cost—$50.00

Plating solutions *are held at correct temperature for best quality of finished electrotypes, at the Kingsboro Electrotype Corp., Brooklyn, N. Y. . . . by means of Honeywell Remote Bulb Controllers.*

Honeywell Controller Cost—$29.00

improve quality

Don't overlook these simple, low-cost controllers...they're the ideal solution to hundreds of problems.

IN PRACTICALLY any plant, there are dozens of spots where simple, inexpensive Honeywell Industrial Controls can be put to work to improve the quality of production. The examples pictured here give only a few of the ways that this versatile family of controls can regulate temperature, pressure, vacuum, liquid level and humidity . . . the variables that directly affect quality of finished goods.

For your specific application, you can choose from more than 7000 different models in the Honeywell Industrial Controls line. All are simple in design, rugged in construction, modest in price. All are backed by the precision manufacturing know-how and extensive application experience of the world's largest manufacturer of controls. In addition to improving quality, these controls can also be relied on to increase production, reduce maintenance, increase safety and cut costs.

Ask your local Honeywell sales engineer to discuss how you can apply these controls in your own plant. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

Also manufacturers of a complete line of precision measuring, recording and controlling instruments.

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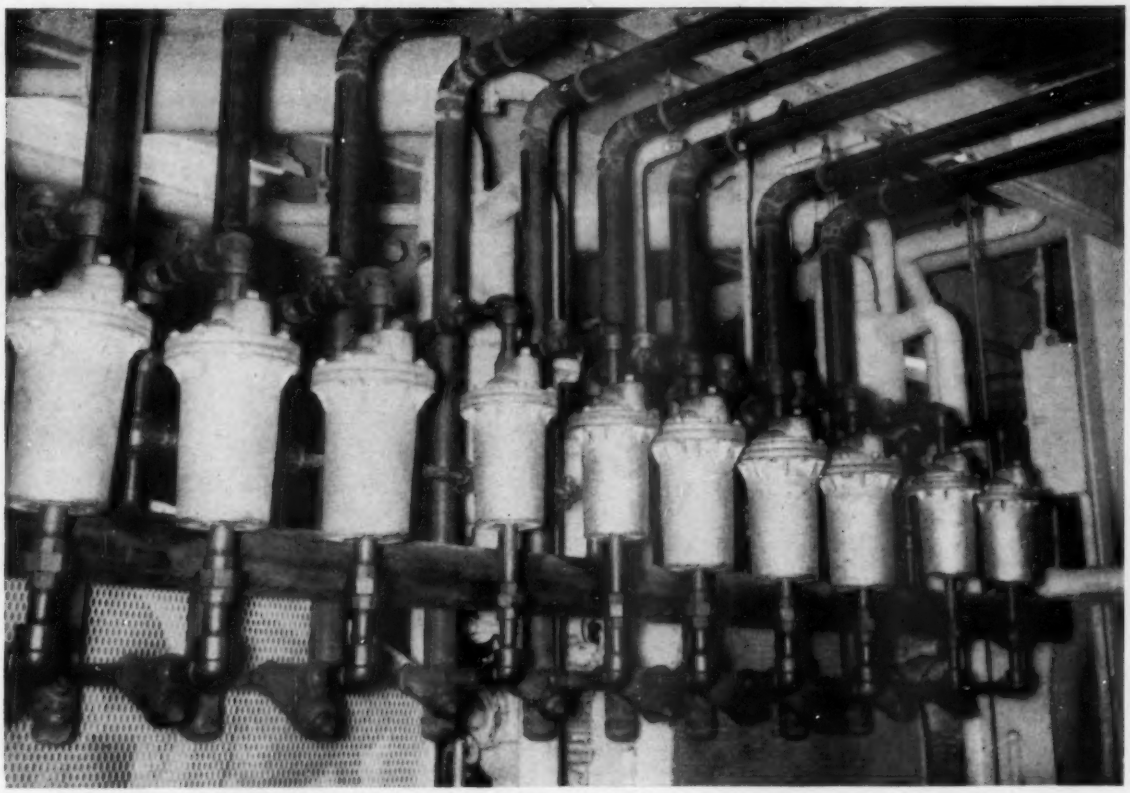

Tip on Choosing Steam Traps: Run Tests with a Pyrometer

Bottom inlet-top outlet traps in six sizes, ½" to 2" connections; 950 to 20,000 lbs/hr capacity.

Side inlet-side outlet traps in five sizes, ½" to 1¼" connections; 680 to 6700 lbs/hr capacity.

Integral strainer traps in three sizes, ½" and ¾". Cost less than trap and separate strainer, save fittings and labor.

A common problem—Traps on Rogers spray driers at Rochester Dairy Company, Rochester, Minn., required frequent servicing—used up about two months of one man's time annually. And, then, within about 30 days after trap servicing, drier temperatures would be 100 degrees below steam temperature. Nobody has to put up with such trap troubles!

Take a tip from this solution!—Henry T. Maass, Building and Utility Supt., took action. He ran extensive pyrometer tests on his driers, using different makes of traps.

100° hotter!—The driers are now equipped with Armstrong inverted bucket steam traps. Temperatures correspond to steam pressure—100 degrees hotter than before. Maintenance?—negligible. Rochester carries $63.31 of Armstrong trap parts in maintenance store against $873.52 in parts for another make of traps that haven't been replaced yet.

Moral—A small investment in Armstrong steam traps can make a world of difference in performance of production equipment and in cost of maintenance. Call your local Armstrong Representative, he has the products and the experience and the ability to be of real assistance.

The 44-page Steam Trap Book is "the handbook of steam-trapping". Selection, installation, maintenance, capacities, data, prices, tables, charts, useful material—yours for the asking without any obligation. Also see data in Sweets or Chemical Engineering Catalog.

Armstrong Machine Works
912 Maple Street, Three Rivers, Michigan

Application Engineered
ARMSTRONG STEAM TRAPS

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HOW TO USE STANDARD HALLOWELL UNIT WORK BENCHES AND ACCESSORIES IN PLANT MODERNIZATION

MODEL 640 - BENCH TOP, DRAWER UNIT, CABINET UNIT, TWO BASES

ASSEMBLE THEM IN CONTINUOUS LINE - JOINED IN THE MIDDLE OF THE UNITS OR BUTTED END-TO-END

USE THEM AS INDIVIDUAL BENCHES

4 TOP MATERIALS, 2 LENGTHS, 2 WIDTHS
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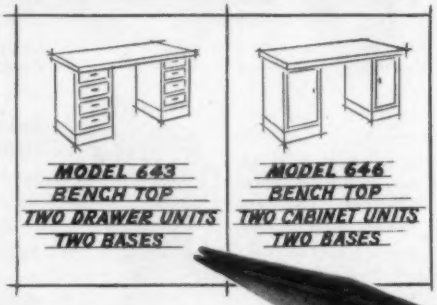

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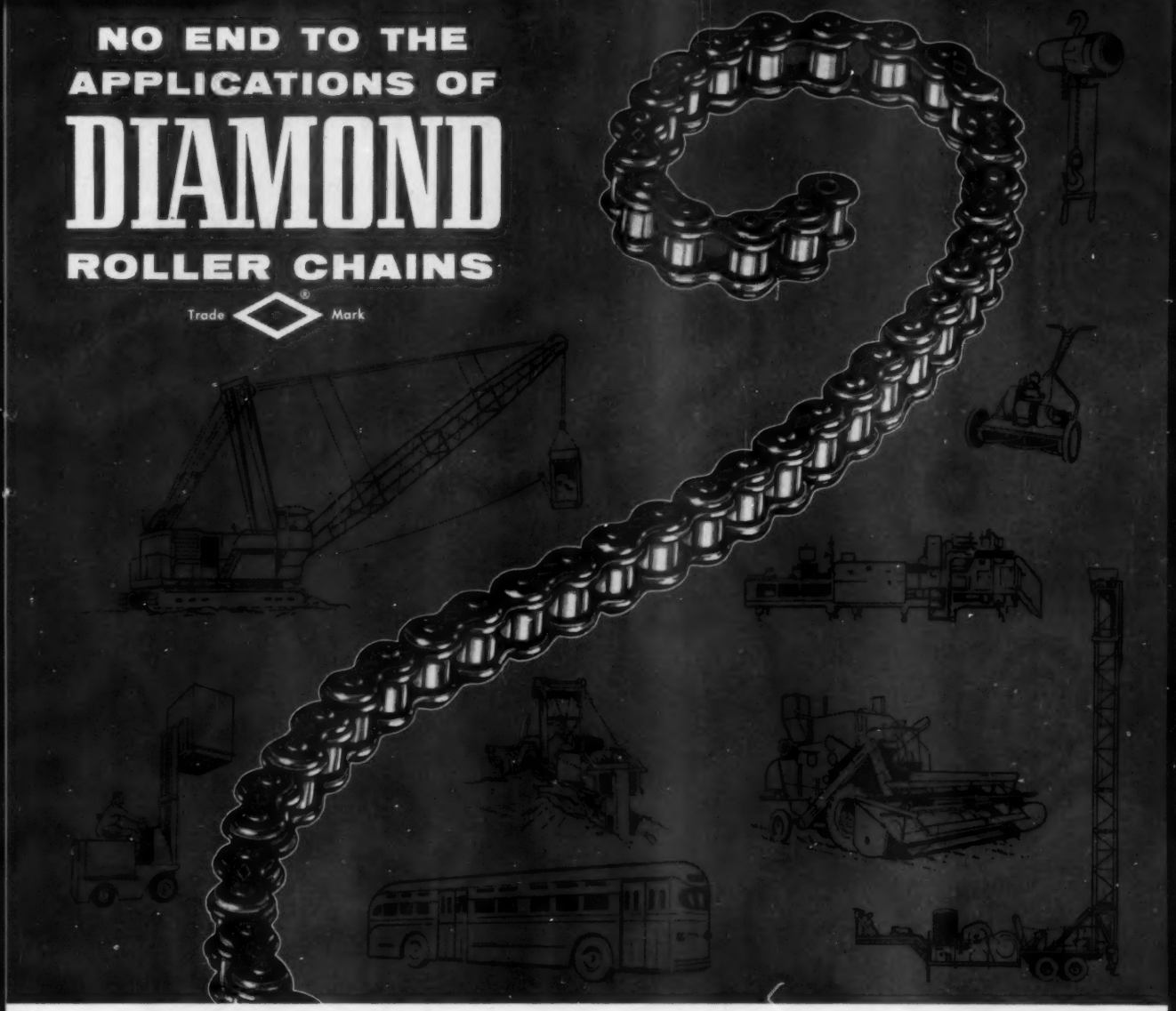
NO END TO THE APPLICATIONS OF DIAMOND ROLLER CHAINS

Trade ® Mark



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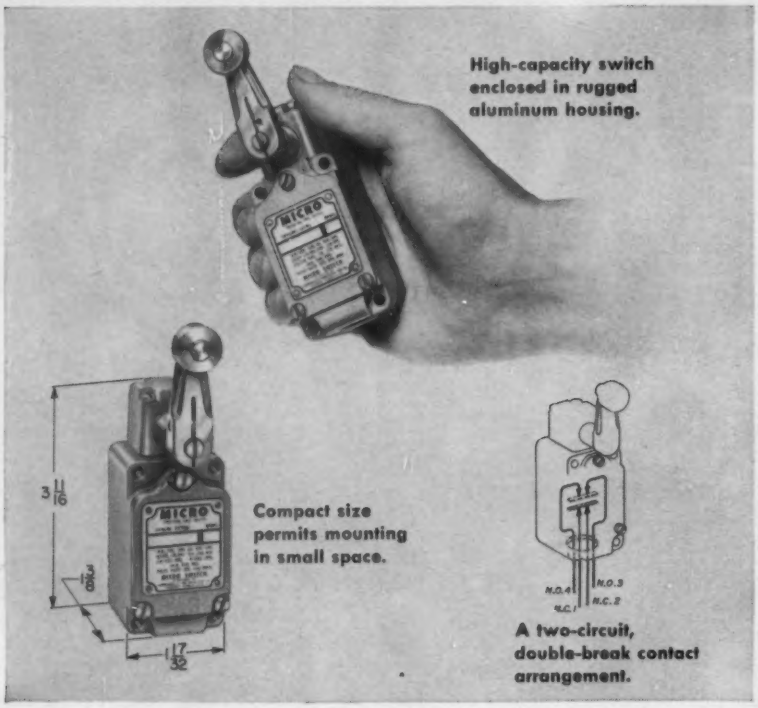
MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN



Here is a compact 2-circuit limit switch that meets a wide variety of plant applications

This MICRO precision switch is designed to meet every requirement for a compact 2-circuit switch for use as a limit, safety or interlock switch on complex production equipment.

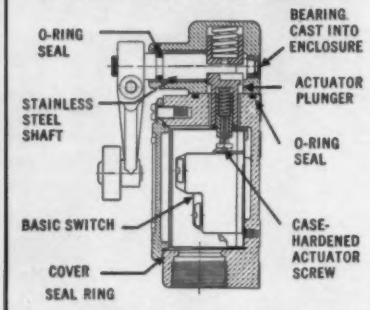
It has small size, extreme versatility, precision, reliability and ruggedness. All moving parts and the switching chamber are completely sealed, protected from wear or becoming fouled. Field adjustability permits its use in any type of application or location

Two-circuit contact arrangement allows flexibility in circuit design. Reliability of the precision, snap-action unit assures accurate repeat operation throughout many millions of hard, fast actuations. Although small and compact in size, this switch is not only a precision instrument. It is designed and built to stand the most severe abuse.

The electrical rating is: 10 amperes 120, 240 or 480 volts a-c; ½ H.P. 115 volts a-c; 1 H.P. 230 volts a-c; .2 ampere 115 volts d-c; .1 ampere 230 volts d-c; .04 ampere 550 volts d-c. Pilot duty rating is: 600 volts a-c, max.

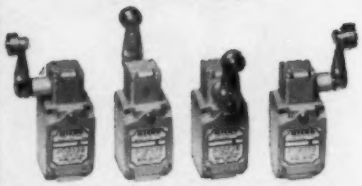
Like many other precision switches in the MICRO SWITCH line, this versatile 2-circuit switch is an ideal component for installation on present plant equipment. MICRO precision switches make production machinery safer, more automatic and more productive.

Seals Provide Maximum Protection



Sealing is provided by use of O-ring seals on the actuator shaft and between the actuator head and the housing. A synthetic rubber ring seal is provided for the cover. These seals provide maximum protection against entrance of dust, oil and other liquids. The switch meets NEMA specifications for an oil-tight pilot device.

Adjustable Head Assembly



The switch is easily mounted in almost any location. The user can remove the head and locate it in any of 4 positions (as illustrated).

Field Adjustable Actuator

The roller arm actuator is field adjustable through 360 degrees, positively locking in any position. Actuators are assembled to operate in either direction. They can also be converted to operate in one direction only, clockwise or counterclockwise

Send for new catalog 83 on industrial enclosed switches.

MICRO precision switches are sold by distributors in key cities everywhere. Look under "Switches, Electric" in the yellow pages of your phone book.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

In Canada, Leaside, Toronto 17, Ontario • FREEPORT, ILLINOIS

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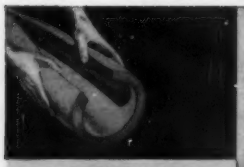

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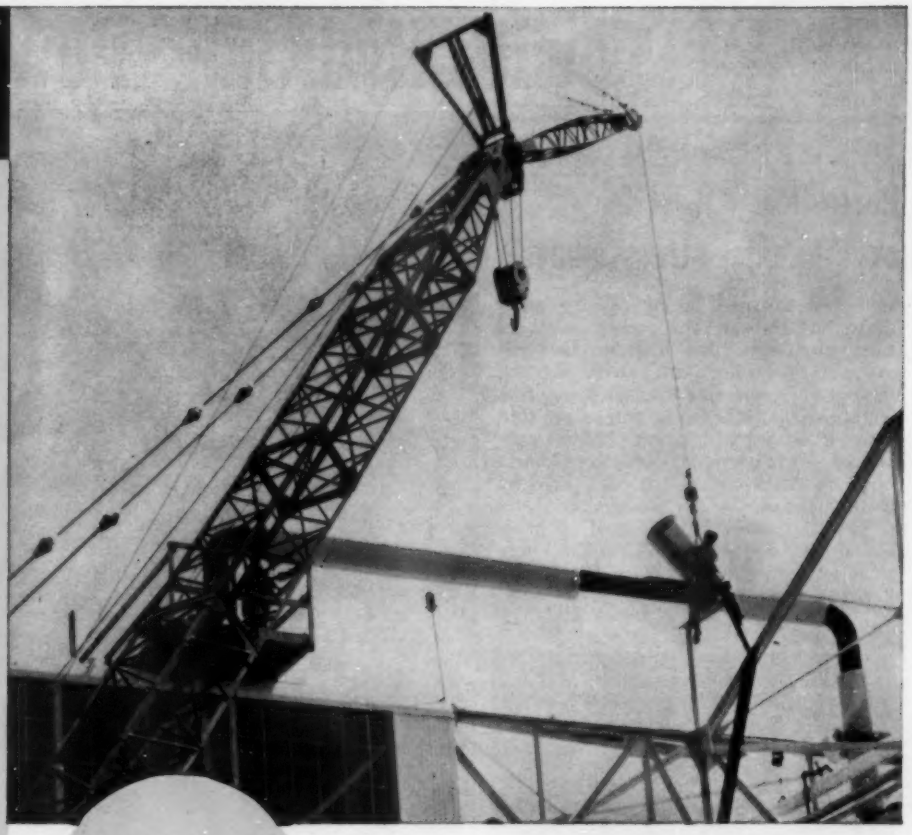

Anyone can apply SNAP*ON anywhere!

Versatile is the word for G-B Snap*On, the new one-piece pipe insulation molded of fine glass fibers. Whether you need pipe insulation for hot or cold piping, in the plant or outside, in ¾" to 33" sizes, Snap*On is the pipe covering for you. Anyone can handle this new lightweight and indestructible insulation . . . anyone can apply it by simply spreading the single seam and snapping the material over the pipe.

As the photo indicates, if you can put a man in contact with a run of pipe, he can quickly insulate it all by himself with Snap*On. The one-piece construction of Snap*On reduces labor cost of installation one-third, in many cases. Waste is nil, even though plant workmen have never used the product before nor received any special training in its application.

If you can't say as much for your present pipe insulation, call your nearby Snap*On distributor whose phone number is shown in the adjoining column. He'll furnish you samples and complete technical data that will prove to you that for thermal efficiency, low-cost application, and permanence, there's nothing like G-B Snap*On. Call him today.

GUSTIN-BACON *Manufacturing Company*

Thermal and acoustical glass fiber insulations • Pipe couplings and fittings • Molded glass fiber pipe insulation

244 W. 10TH ST., KANSAS CITY, MO.

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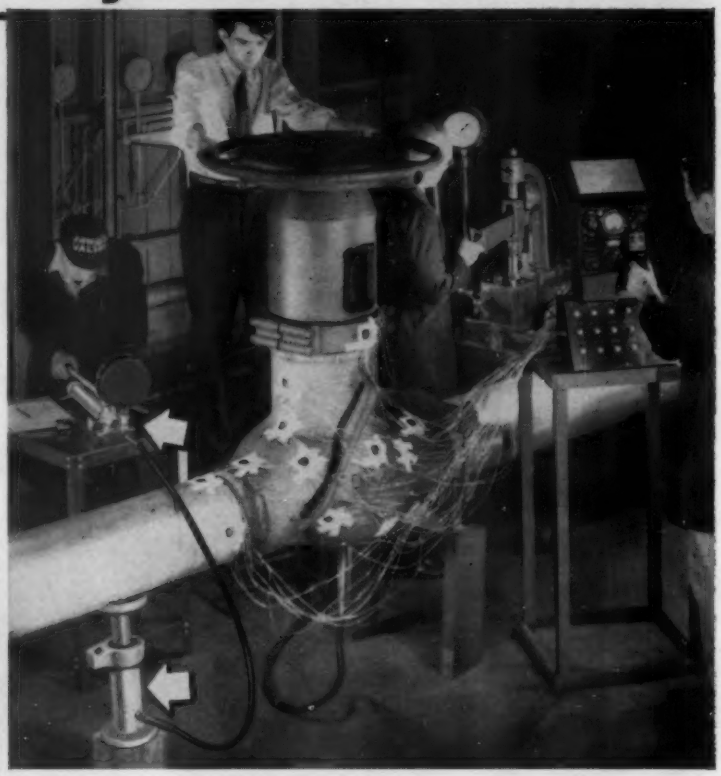
IDEAS with Hydraulic Power Tools

Porto-Power used for experimental stress analysis

Using Blackhawk's 20-ton gauge-equipped "Porto-Power," this valve manufacturer simulates pipe line stresses and measures the effect on valves. Six-foot hose permits operator to place pump in a convenient position so he can safely concentrate on gauge reading. This is only one of the many *ideas* constantly developed by Blackhawk — or discovered by manufacturers — for saving time and money on testing, production, maintenance, *all* phases of industrial and construction activities . . . with Blackhawk "Porto-Power" hydraulic tools.



$3200 saving—Three Blackhawk 20-ton rams and electrically driven pump are used on this press brake. Its user and builder report that the press cost only $800 (including Blackhawk hydraulic components) compared with estimates of $4,000 for a standard press to do the same job.

See Sweets Plant Engineering Catalog File 1L/BL

"Man alive! This hydraulic jack DOES EVERYTHING but walk and talk!"

"Porto-Power" is like a human hand — with force to push, pull, lift, bend, press, spread and clamp. And it *does* talk — talks big savings of time, money and materials on 1001 industrial and construction jobs. Furthermore, Blackhawk makes industry's *most complete* line of hydraulic power tools — including all the necessary jacks, pumps, rams, kits, work attachments, valves and fittings. You do it the *easy* way with Blackhawk hydraulic tools!

IDEA MAN See your industrial distributor — or write today to Blackhawk — for free catalog H-201. It's packed with *specific ideas* for using Blackhawk Hydraulic Tools.

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Blackhawk

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BLACKHAWK WORLD'S LARGEST MANUFACTURER OF HYDRAULIC TOOLS

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CONSTRUCTION BRIEFS — a review of fundamentals for the plant engineer

Prepared by R. J. Bonthron, Mechanical Engineer

TRUSSES

IN THE PREVIOUS "Construction Brief" the forces in the members of a truss were determined by the method of joints. This method makes use of the fact that all the members are two-force members and the forces acting at any pin must be in the direction of the members joined at that pin. This means that all the forces acting at that pin pass through the pin and form a concurrent force system. For such a force system there are only two equations of equilibrium and only two unknowns can be determined at any one pin. When using the method of joints, the analysis must start at a point where there are only two unknowns and proceed from joint to joint to any particular member in question.

Another method is available which makes use of a nonconcurrent force system for which there are three equations of equilibrium, making it possible to determine three unknowns at a time. This method, known as the method of sections, enables one to start the analysis at almost any point in the truss. Thus you can generally determine the force in any member of the truss without having to find the forces in any of the other members. The usual procedure is to pass a cutting plane through three, but not more than three, members of the truss. If an external force is applied to each several member exactly equivalent to the load transmitted by that member, each portion of the truss will be in equilibrium.

As an example, consider the overhanging truss shown in Fig. 1. This truss is supported at points A and E and carries two vertical loads of 2000 lb each at points F and H.

If we pass a cutting plane through members DF, DG and EG, the forces acting on each portion of the truss will be as shown in Fig. 1b and 1c.

The equations of equilibrium applied to Fig. 1b yield the following results:

$\Sigma M_D = 0$
$F_{EG}\ (10) - 3000\ (20) = 0$
$F_{EG} = 6000$ lb compression

$\Sigma F_Y = 0$
$7000 - 3000 - (.707)\ F_{DG} = 0$
$F_{DG} = 5656$ lb tension

$\Sigma F_X = 0$
$F_{DF} - F_{EG} + (.707)\ F_{DG} = 0$
$F_{DF} = 2000$ lb tension

The equations of equilibrium applied to Fig. 1c give the same values:

$\Sigma M_G = 0$
$2000\ (10) - F_{DF}\ (10) = 0$
$F_{DF} = 2000$ lb tension

$\Sigma F_Y = 0$
$(.707)\ F_{DG} - 2000 - 2000 = 0$
$F_{DG} = 5656$ lb tension

$\Sigma F_X = 0$
$F_{EG} - (.707)\ F_{DG} - F_{DF} = 0$
$F_{EG} = 6000$ lb compression

The force in the member DF may be obtained from Fig. 1b in another way. Suppose one sums moments about the point where F_{DG} and F_{EG} intersect, pin G.

$\Sigma M_G = 0$
$F_{DF}\ (10) + 7000\ (10) - 3000\ (30) = 0$
$F_{DF} = 2000$ lb tension

If it were necessary to find only the force in member DE, one would pass a cutting plane through members BD, DE, and EG as shown in Fig. 1. The forces acting on the left hand portion of the severed truss will be as shown in Fig. 2.

The force in member DE may be obtained by summing the forces in the vertical direction.

$\Sigma F_Y = 0$
$7000 - F_{DE} - 3000 = 0$
$F_{DE} = 4000$ lb compression

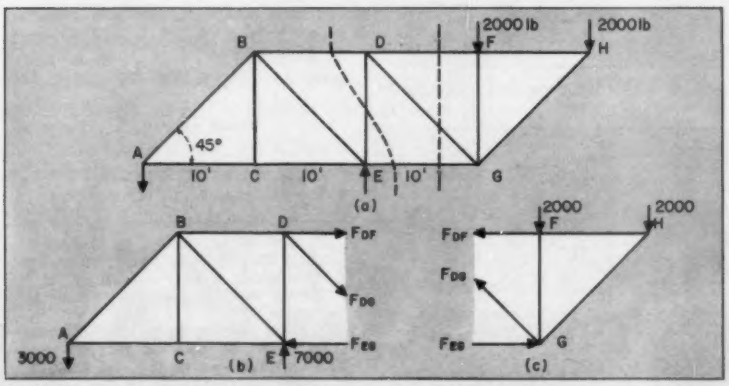

Fig. 1. Overhanging truss construction. Cutting plane as shown permits solution

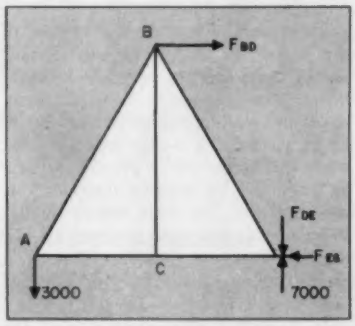

Fig. 2. To find the force in only one member, DE, the plane is cut as shown

The method of sections is very convenient when choosing the direction of diagonal members so as to be in tension rather than in compression. As explained in the "Construction Briefs" on columns, a long slender member is capable of carrying a considerably greater load in tension than in compression. It follows then that a much stronger member is required to resist a given load by a compressive force than is needed to resist the given load by a tensile force if the member is long and slender.

Moving a member of the truss from one diagonal of a rectangular panel to the other diagonal will affect the forces in the other members connected at the pins involved in the change. Such changes tend to shift the larger internal forces from one horizontal member to another. Since it is common practice to make all the horizontal members identical, these changes of diagonals do not endanger the total load carrying capacity of the truss.

To see how this operates, consider the truss shown in Fig. 3. The dotted lines indicate possible directions for the diagonals. The problem is to decide whether the diagonal member will be in tension when running from C to D or from B to E. Suppose a cutting plane is passed through BD, CE, and the diagonal in question. It can readily be seen that if the diagonal runs from C to D, as in Fig. 3b, the force in the diagonal must be compression in order for the sum of the vertical components of force to be zero.

If the diagonal runs from B to E,

as in Fig. 3c, the force in the diagonal will be tension. By passing vertical cutting planes through the two remaining panels, it will be seen that to obtain tensile forces in the diagonal members rather than compressive forces, they must run from D to G and from G to H.

To successfully apply this method to the choice of diagonals, the loading on the truss must be constant in magnitude, direction and location. In many cases the loading on the truss moves, as in the case of a moving crane, or varies in magnitude from day to day, as might be the case in floor load of a warehouse. The truss shown in Fig. 4 has been designed so that all the diagonals are in tension. This is a simple light span truss with a single load three spans from the left support.

If this truss were viewed from the opposite side, or from the other side of this page, it would be a simple eight-span truss with a single vertical load five spans from the left support and three spans from the right support. The forces in the diagonal members remain tensile forces whether we look at the truss from the front of the page or from the back. Viewing the truss from the back is equivalent to moving the load from point A to point B. We see that to maintain tensile forces in the diagonal members when the load shifts, the diagonals in the two center panels must be changed.

When the dimensions of the truss are small and the loads large, the members will have a small slenderness ratio and can carry about as much compressive force as they can tensile force. In such a case the direction of the diagonal is not important. If, however, the dimensions of the truss are large and the loads small, the members will have a large slenderness ratio and can carry far more tensile force than compressive force. In the case of the large slenderness ratio, the problem of shifting loads is often solved by using both diagonals. When both diagonals are used in a panel, one is in tension and the other in compression. The maximum compressive force that can be produced in the diagonal is the critical buckling load. The common practice is to neglect the compressive force as compared to the other loads, that is, to assume the compressive member carries no load at all. This would certainly be true if the diagonals were made of flexible wire or chain.

The load carrying capacity is not the only factor to be considered in the design of a truss. Another important factor is the rigidity of the truss. The rigidity may be defined as the amount of deflection per pound of load at the point where the load is applied. This is a rather loose definition since the load may be applied and the deflection measured at many points. However, it does give a basis for comparing similar trusses. One thing that can seriously affect the rigidity and give rise to noisy vibrations is excessive play in the initial assembly. This is particularly true of bolted construction.

This problem may be solved to a considerable extent by using both diagonals in every panel and assembling the diagonals with initial tension. The initial tension may be produced by purposely misaligning the bolt holes or by assembling the diagonals while the truss is in a deformed position. The advantage of using both diagonals in this manner is that the structure is rigidly held together so that it does not wear at the joints. The maximum force in a given member when the load is applied is altered very little by this prestressing process. When a rectangular panel is deformed under load to a parallelogram as shown in Fig. 5, the increase in the length of diagonal BD is equal to the decrease in the length of AC. If the diagonals are of the same design, the tensile force in BD will increase by the same amount the force in AC decreases.

Suppose that in the truss shown in Fig. 1, we add an additional diagonal running from E to F and prestress both EF and DG with an initial tensile force of 2828 lb. The application of the load to the truss will deform the panel as shown in Fig. 5. The tensile force in DG will increase by 2828 lb to 5656 lb, while the tensile force in EF will decrease to zero.

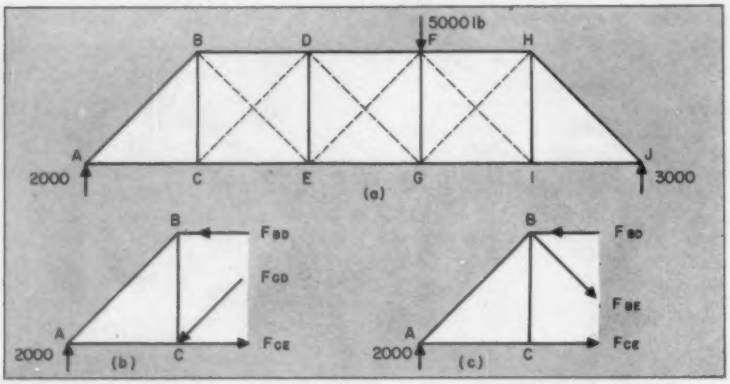

Fig. 3. Truss drawn to illustrate effect of diagonals in compression or tension

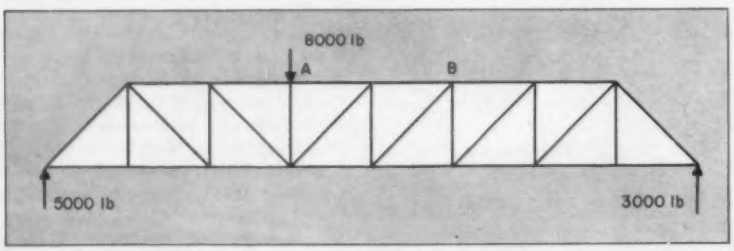

Fig. 4. Simple truss with all diagonals in tension with single vertical load applied

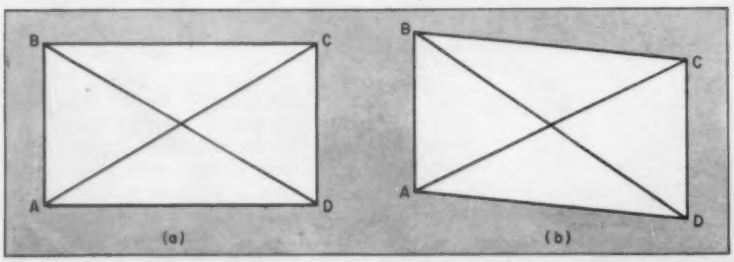

Fig. 5. Rectangular panel ABCD, when deformed, takes on parallelogram shape

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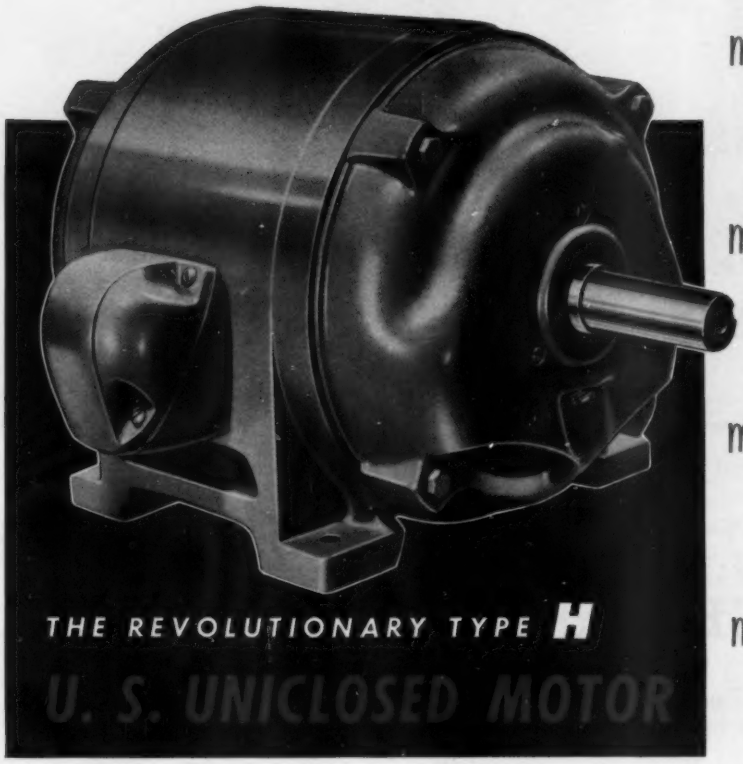

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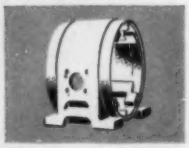

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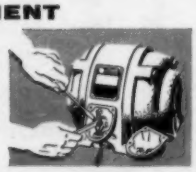

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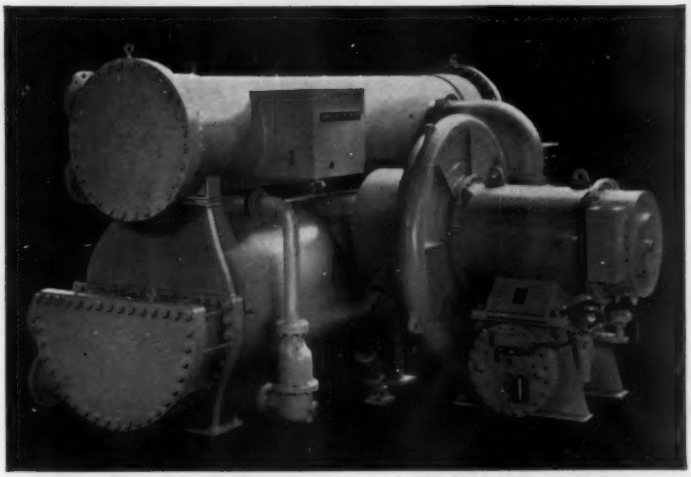

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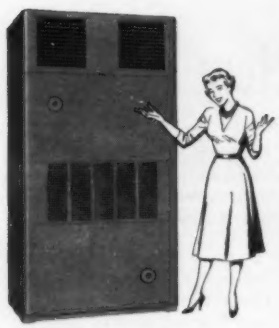

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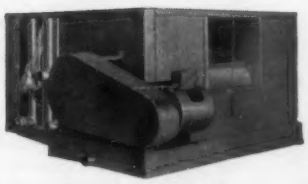

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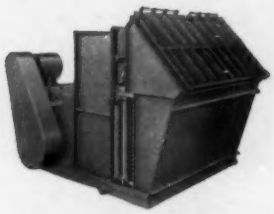

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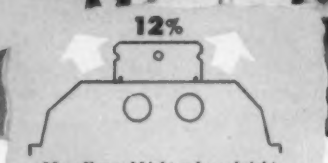
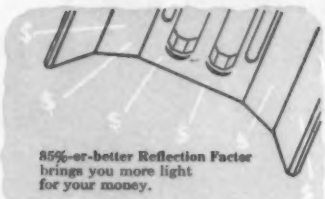


More Upward Light reduces brightness contrast, increases seeing comfort, minimizes eye fatigue.



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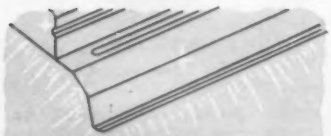

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Maintenance men on emergency calls speed through the truck-wide tunnels unhampered by wind or weather, tide or traffic. Accessibility is one of many good features inherent in tunnel's design. For example, as shown at right, most valves are within easy reach. No ladders are necessary for such routine turning-on, turning-off jobs

Union Oil's Research Lab Maintenance Department Says:

Maintenance Tunnel "Worth Cost"

"White elephant" might have been the label tacked onto the underground, truck-size tunnel at Union Oil Company's Research Center . . . This was before the final count was in and maintenance men were able to show that quick repairs and little down time made this apparent luxury a valuable asset in cutting operational costs

Change-overs are easy thanks to short pipe runs from corridor piping to labs above, through this typical access hole

Question: "Will the investment be returned?"

BACK IN MARCH, 1952, PLANT ENGINEERING told of Union Oil Co.'s Brea (Calif.) Research Center, its $8,000,000 layout, 232,000 sq ft and underground truck-size maintenance tunnel—a half-mile of reinforced concrete corridors carrying seven lab services, power and industrial wastes.

There was no doubting the uniqueness of Brea's underground system. All services, hung from the corridor's ceiling, lay exposed, within reach of maintenance men. Pick-up or flat-bed trucks could trundle pipe and repairmen the tunnel's length. Slots, in the corridor's roof, fed branch piping overhead, directly to lab benches.

The big question wasn't the tunnel's practicability, but its cost: was the extra expense worth it? Would the tunnel prove a maintenance bonanza, something plant builders across the nation would have to consider—and seriously—when designing new industrial units?

Now, five years later, Union has a documented answer: a resounding "worth the cost—and more!"

Says Maintenance Foreman O. L. Whitfield, "The utility tunnel has more than paid for itself."

Last month, as a PLANT ENGINEERING correspondent visited Union's Brea plant for this progress report, a pick-up truck wheeled into the main tunnel, dispatched maintainers who quickly set to work on a leak which a routine "walk-through" had revealed. A few turns of branch-line valves (they're overhead but within easy arm's reach), and maintenance men isolated the trouble. A step ladder put them within wrench-reach of the defective joint. Five minutes—without excavation—and the repair was made, service to the lab restored.

What little leakage there'd been was washed off the corridor's floor, the water drained to a gutter running the tunnel's length (eight sump pumps boost drainage to an outside industrial sump).

With clean-up, the repair was completed—and the maintenance men went back to their routine schedule.

That schedule includes a twice-daily "walk-through" by Utility Foreman A. C. Moore or Steamfitter Foreman Joe Gianetto.

"Nothing to it," says Moore, "I begin at one end of the tunnel. I walk through the main run, eyeing those white-painted pipes. Waste line leaks show up visually—as a discoloration against the white pipe joints. Gas lines, carrying methane, are odorized. Labs usually can tell us where there's a gas depressurization, help us locate the leak.

"Labs assist in finding air-line leaks, too, although a leak's usually audible. A 'walk-through' also involves checks (twice daily) of steam stations. They're located in tunnel alcoves. A typical steam station reduces 140 psi

steam to 50 psi, for lab stills and air conditioning. Further reduction to 10 psi feeds to lab benches. A routine walk-through calls for reading pressure gauges at each steam station, checking condensate tanks and steam regulators. At each station, too, there's a sump pump.

"After the primary walk-through, I keep going, inspect all three main tunnel branches. They're the same size, 9 ft high, 11 ft wide. I also routinely check piping in the smaller (6 ft high, 4 ft wide) feeder tunnels. They're adjuncts to the system, feeders carrying piping to the cafeteria, to the mechanical rooms above each lab building and to other units. That's how we take daily tunnel check."

Now, as in the original design, piping hangs bracketed and exposed from the ceiling. Clearance is kept to 6 ft. And except in rare cases, pipe is single-decked. The tunnel has a 6-in. reinforced concrete roof, 10-in. thick concrete walls. Where the concrete roof isn't running beneath a building, it becomes sidewalk. Stairways at each end of lab buildings lead to the sub-surface corridors. Slots are located every 10 ft along tunnel ceilings —utility openings leading directly to lab benches above.

Explains Maintenance Foreman Whitfield, "We've been faced with one continuous change-over. Somebody needs air or gas where it wasn't originally planned. With most plants it would mean calling in excavating crews, chopping through a wall, patching and repatching. Here, it's a routine job. The utility slots are there. Main headers lie directly beneath. Tie on a T. Run 6 or 7 ft of pipe. Connect to the lab above. And the job's done, the service installed."

Another advantage: maintenance men work overhead and right-handed, with all the freedom they need. No bending, no stooping, no cramped quarters.

Easily handled maintenance jobs keep piling up evidence that in the long-run, tunnels more than repay their original cost.

Good example was installation of mercury traps in many lab sinks. Mercury had been honeycombing lead piping which ran from sinks to corridor-hung, non-corrosive industrial waste headers. Whitfield and general services manager, B. T. Anderson, huddled, decided on mercury traps. It was a routine job. Yet had piping been buried, it would have been a costly major change-over. (As it is, mercury is trapped, salvaged, redistilled, returned to the labs. Salvage has already repaid cost of the traps.)

Not the least of tunnel advantages, believes Union Oil, is good housekeeping (compared to open trenches, man tunnels or ground piping). Weekly a mechanical sweeper cleans up the tunnels. Once monthly corridor floors are washed down. Tunnels are as clean as the labs above—one reason leaks are easily spotted.

At Brea, tunnels carry relatively light runs: power, industrial waste, high pressure steam (125 psi), low pressure steam (10-14 psi), compressed air, methane gas for burners, vacuum, such occasional services as oxygen, hydrogen, CO_2 and nitrogen. But subterranean corridors could well serve many a less-specialized layout. For Union has accomplished in a tunnel what many another plant assigns to a full-size basement.

Union looked ahead, designed tunnels truck-width (ventilation system

frees corridors of monoxide or other gases). The all-covered tunnel has still another advantage: piping runs need only minimum insulation when tunnel run and hung. And expansion joints, always tricky, lie exposed. Union finds that most rough-in work can be done in the tunnels, out of the labs' way.

What does Union Oil's five-year experience with utility tunnels reveal? That original costs are small compared to year-in, year-out reduction in maintenance costs. Union's documented answer? A resounding—"worth the cost . . . and more."

Utility Tunnel Stock Went Up With Maintenance Men Because:

1. While galvanized and coated lawn-sprinkler piping has fallen victim to electrolysis, tunnel piping, not in contact with the ground, is good as new.

2. With in-tunnel piping painted white, leaks show up visually—and immediately.

3. Tunnel proved its worth almost from the beginning. Soon after construction it was found that designers had inadvertently positioned air line T's downward. Condensate was reaching the labs. About 200 T's were involved. Had pipes been buried or less accessible, correction would have been costly —to say the least. As it was, maintenance men merely hauled out wrenches, systematically turned all air line T's upward. No excavating was necessary. The job was completed in but a few days.

4. Joints on non-corrosive air and vacuum lines work loose, must be periodically tightened, even caulked. It's a job routinely assigned a single maintenance man on his regular tunnel "beat."

5. The tunnel is, in effect, a kind of basement, running beneath all labs. Small feeder corridors branch to the plant's cafeteria, dynamometer lab, library and non-lab units. Though smaller, feeders are still "head-high" (6 ft), still accessible.

6. Subterranean tunnels allow complete tear-out and repiping simply by hook-up of a few T's and short (7 ft) runs off main tunnel headers. Further, all this can be done without interrupting service, without disturbing scientists at work in adjacent labs.

7. Additions to the system are easy. There's a 3-ft "dead space" under the tunnel roof. This is a tunnel-long area beginning head-high (6-ft) above the corridor floor and extending to the ceiling, at 9-ft. Hung here are the piping runs. And also, such added units as voltage regulators (for delicate lab projects), vacuum pumps and gas scrubbers. All are mounted overhead in the "dead" area, preserving a uniform 6-ft clearance for men and equipment.

8. Underground corridors definitely establish the low end of many pipe runs, allow air lines to be rigged each end with knock-out pots. Thus, air lines can be periodically blown and cleared. Same low-end system applies to gas lines, which are rigged with scrubbers, removing condensate and scale. Installation of the devices was easy, inexpensive.

Maintenance Control—By the Clock

Provides the Yardstick for Measuring Maintenance Costs

By **JAMES G. ARMSTEAD**, Maintenance Engineer, and
JAMES R. BEERLE, Labor Control Co-Ordinator, **F. C. Huyck & Sons**

IN THIS ERA of concentrated efforts toward cost reduction we hear more and more in plant engineering circles about labor performance. Many of us honestly believe that our maintenance and engineering forces are not as efficient as they could be, and are concerned about references made to maintenance men working from 40 to 70 per cent effectiveness.

We believed ours to be in the order of 60 per cent. We were unhappy, however, that we had no means to measure the degree of this condition; or to measure the degree of improvement after some corrective measures were taken. We were also unhappy about the constant concern of production departments over the cost of repairs, and of top management at the cost of new facilities. We were defending ourselves with generalities and definitely needed a yardstick!

Results of Study

A review of this problem with our chief industrial engineer, Paul C. Lawson, led us to these conclusions:

1. Maintenance work is complex; since there are many variables from job to job, and there are unforeseen operations as jobs progress. Standard work measurement techniques as applied to production operations were unsuitable.

2. Increased degree of supervision to watch for and detect lack of performance, or to head it off by its existence, was a possibility; but had the disadvantage of continuing high cost, and still no measure of improvement.

3. Two control plans were available which break down each job into simple work elements, establish time standards for each element and set a cumulative standard or allowed time by pre-planning each job or analyzing the job as it progresses. These appeared not to suit our needs because of the high cost of collecting the standard data, the time required to accomplish this in relation to our feeling of urgency, and the number of people required to operate the program, at least for a department the size of ours (62 craft workers).

4. Another system was available known as an "Earned Hour Control Plan" which had been developed by George Meyers, at that time connected with the Boston firm of Ernst and Ernst, Accountants and Auditors. The Meyers plan, being essentially one of analyzing past performance, and establishing standards based on average hours per job, or on supervisors' estimates, can be initiated and subsequently operated by a minimum of additional staff. It provides a "tool" for existing supervision to judge their effectiveness in improving performance, and to point out the most fruitful areas in which to work. The averaging tends to wipe out the effect of job-to-job variations.

We took more interest in this plan as we came to realize it was sufficiently "mathematical" to be a realistic measure of performance, yet flexible enough to be kept up to date.

In some installations, we learned, the plan was used as a basis for incentive pay. We decided against this at the start, and planned to use it solely as a supervision tool; but knew that at some future time, if it worked as well as expected, it could be revised and so used.

Consultation with the Ernst and Ernst staff men familiar with this plan enabled us to estimate the following:

1. Changes desirable in our time reporting system.

2. Amount of clerical work involved in analyzing past performances, plus current orders and in tabulating data for calculating average times.

3. The cost of our labor for this clerical help; first in the initial "period of installation," and then the continuing cost of operation.

4. The cost of the consulting services of Ernst and Ernst engineers.

5. The savings to the company resulting from improved labor effectiveness.

With this information we went to management and obtained approval for the expenses involved and submitted a schedule of anticipated expenses and economies.

An agreement was made with Ernst and Ernst, who assigned an engineer to supervise the installation.

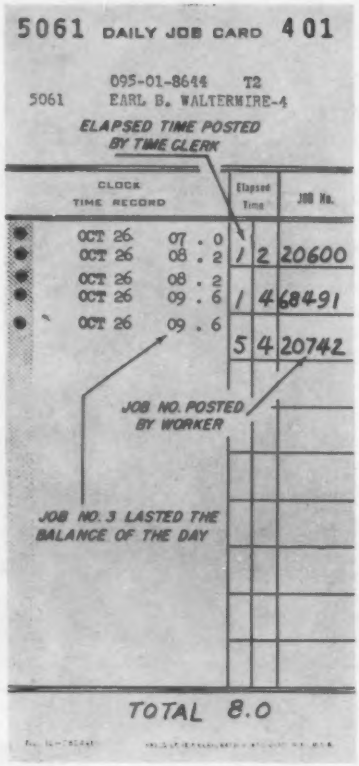

5061 DAILY JOB CARD 401
095-01-8644 T2
5061 EARL B. WALTERMIRE-4
ELAPSED TIME POSTED BY TIME CLERK
CLOCK TIME RECORD
Elapsed Time
Job No.
OCT 26 07 . 0
OCT 26 08 . 2 1 2 20600
OCT 26 08 . 2
OCT 26 09 . 6 1 4 68491
OCT 26 09 . 6
5 4 20742
JOB NO. POSTED BY WORKER
JOB NO. 3 LASTED THE BALANCE OF THE DAY
TOTAL 8.0

Fig. 1. Time cards record "start" and "stop" periods of maintenance jobs

We selected a man from our staff to do the major portion of the clerical and analytical work. We were fortunate to have a well qualified person who had been a carpenter, and then a construction co-ordinator for a three year building and equipment renovating program. He had a good working knowledge of maintenance work in general, the types of tasks performed by our craftsmen, the terminology used in describing their work and, most important of all, an aptitude for the analysis and appraisal of past performance and interest in "cost control."

In order to have at hand the data required to make the analysis and to establish the standards, the following things were needed:

1. A work order written for each craft for each job.

2. A sufficiently accurate description of each job to permit combining those that are similar on the same daily work sheet, and to recognize those that vary from the usual.

3. A method of recording time spent on each job.

4. An individual capable of analyzing work performed and helping supervisors to phrase the work orders with consistent descriptive terms. He would also tabulate actual times, and calculate averages.

Our first step was to inform maintenance supervision of our plans. We described the program, what it was intended to do, what we expected of them, and finally, what all this would do to help them in the proper fulfillment of their cost control responsib'lities.

Our next step was to analyze all work orders processed during the six months prior to our starting date. This study revealed the following conditions:

1. Our reporting of time was inaccurate. It had been verbal, and errors or omissions resulted in total daily times that did not check with payroll times and resulted in incorrect charges to departments being served.

2. We were not consistent or accurate in describing, exactly, the work performed; so, it was difficult to determine whether many jobs were similar enough to be classed as a type, or not.

3. Our work orders were "per job" and lumped all crafts involved on the same order.

We purchased an IBM punch clock, that records in hours and tenths, and cards, Fig. 1, on which elapsed time and job numbers could be recorded alongside of punched "start" and "stop" times. This was placed by the door to the tool crib which is centrally located for the men. The clock is also convenient to the tool crib clerk who is also the time clerk. Each craftsman rings in and out on each job and enters the work order number. They punch at the start of the shift, but skip lunch hours. The clerk deducts lunch time from jobs that bridge the lunch period, unless the foreman has marked "worked through" on the card. No ring out is made at normal quitting time. A check out at any other time is rung.

How Work Orders Are Processed

Work orders were arranged to indicate craft and are written for each craft to work on a job. See Fig. 2. Job descriptions are corrected as jobs are performed to insure greater accuracy.

Work orders are a four-part form. One stays with the requesting foreman. A second goes to the time clerk for daily entries, then to the cost control clerk for tabulation, and finally to the accounting department for summary costing and filing. The third goes to the cost department, and after being marked with the total job cost, is returned to requesting foreman. The last form is for the craft supervisor to plan the work schedules, then it is given to the worker while on the job. The worker uses it to copy the number from the on-job punch card and to file material requisitions at the storeroom. He also changes the description as he finds necessary to describe what he has done. The time clerk files his copies by number by crafts. Every morning he posts the elapsed time from each individual's job cards to the appropriate work orders.

A code system was established in which crafts were numbered as: 1. Machinists; 2. Electricians; 3. Carpenters; 4. Pipefitters; 5. Painters; and 6. Yardmen.

Job cards were numbered with the payroll clock number, the man's name and a code to indicate craft and shift; i.e., 401 as 1st shift pipefitter, and 203 was 3rd shift electrician, etc.

Next a series of numbers were established to identify each of the types of jobs, by craft, as follows:

Routine jobs — recurring at least once a week—for Machinists are indicated by 1; the routine number is 001; therefore, the jobs would be written 1002; 1003; etc.

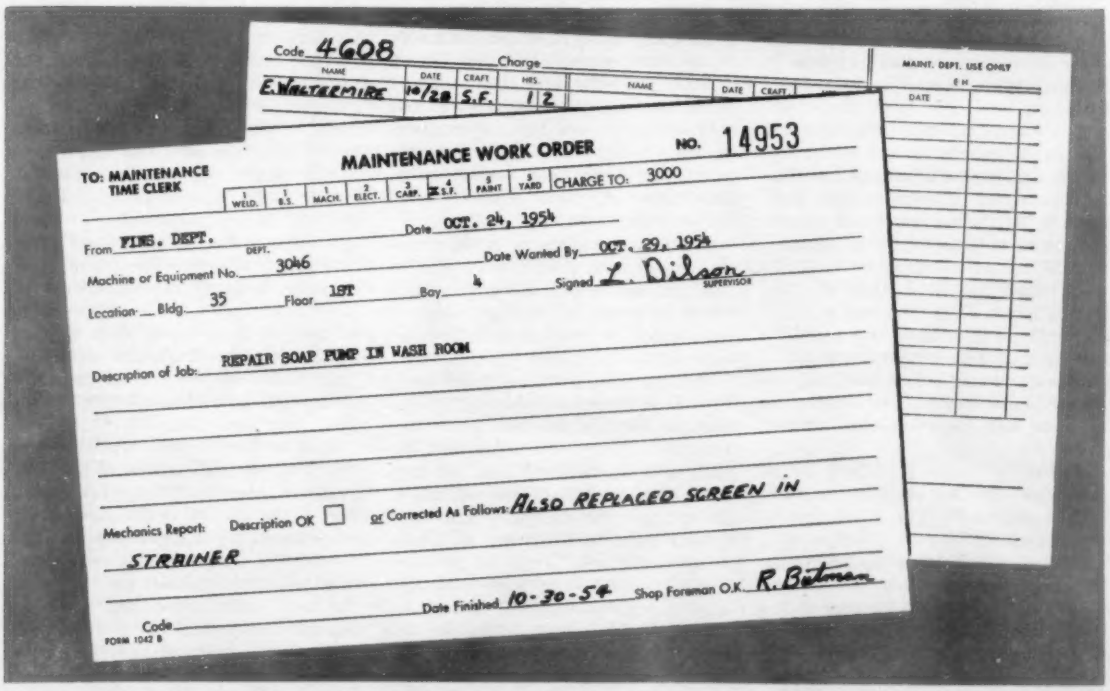
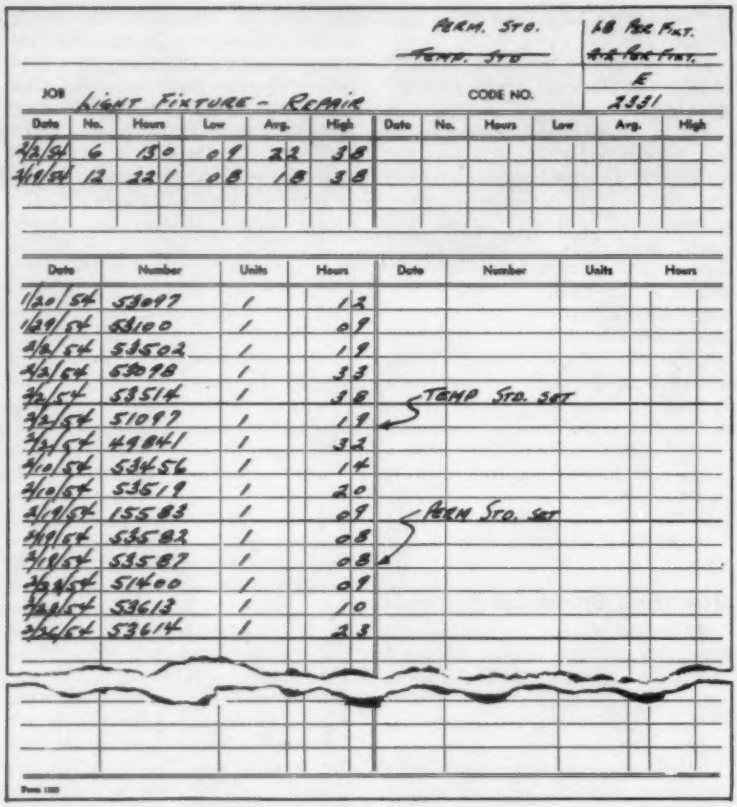


Fig. 2. Typical example of a work order which indicates the craft, type of work to be performed, etc. Each work order is a four-part form: one copy each for the foreman, the time clerk, the cost department, and the craft supervisor


PERM. STD.
~~TEMP. STD~~
LB PER FLT.
~~E.H. PER FLT.~~
E
JOB LIGHT FIXTURE - REPAIR
CODE NO. 2331

Date	No.	Hours	Low	Avg.	High	Date	No.	Hours	Low	Avg.	High
4/2/54	6	13 0	0 9	2 2	3 8						
4/11/54	12	22 1	0 8	1 8	3 8						

Date	Number	Units	Hours	Date	Number	Units	Hours
1/20/54	53097	1	1 2				
1/29/54	53100	1	0 9				
2/2/54	53502	1	1 9				
2/2/54	53098	1	3 3				
2/2/54	53514	1	3 8	TEMP STD. SET			
2/2/54	51097	1	1 9				
2/3/54	49841	1	3 2				
2/10/54	53456	1	1 4				
2/10/54	53519	1	2 0				
2/9/54	15583	1	0 9	PERM STD. SET			
2/10/54	53582	1	0 8				
2/11/54	53587	1	0 8				
2/24/54	51400	1	0 9				
2/24/54	53613	1	1 0				
2/26/54	53614	1	2 3				

Fig. 3. When 12 or more routine entries are made, the average or temporary standard, 2.2 hours, is re-examined and given permanent standard rating, 1.8 hours

Repetitive jobs—recurring less than once a week, but at least once a month—for Electricians are indicated by 2; the repetitive number is 101; 2102; 2103; etc.

Non-Repetitive jobs—not listed as routine or repetitive and which the foreman estimated to require less than 50 hours—for Carpenters are indicated by 3; the non-repetitive number is 6; zero to eight hours is indicated by "08"; 8 to 16 hours by "16"; 16 to 24 hours by "24"; 24 to 32 hours by "32"; and 32 to 50 hours by "50." For example a 32-hour, non-repetitive job for a carpenter would be 3632.

Non-Estimated jobs—those that are purely experimental, and where no estimate can be made—are marked "700" for all crafts.

Estimated jobs—in excess of 50 hours by previous estimate, or foreman's judgment—are coded for all crafts as "800."

Those work orders found in the analysis of the previous six months which were reasonably described and the time seemed to be in order were posted on the "daily work sheets." One sheet was used for each routine, repetitive and class of non-repetitive job for each craft.

Simultaneously, work orders processed daily, were classified and added to the daily work sheets. See Fig. 3.

Code numbers were then assigned to all routine and repetitive jobs and lists were made out for each craft supervisor telling him how to code any job he received. Work orders were, from then on, coded when received by the supervisor.

When work orders for a six month period had been posted, we found we had sufficient entries on the daily work sheets to cover an average range of conditions, and we proceeded to set our standards.

Routine jobs were computed as in Fig. 3. A three-word description was used to identify the job. Code numbers also appear. If entries were less than six, no standard was set until these were six. If between six and 12 an average was computed and listed (upper right hand corner) as a temporary standard. When 12 or more entries existed the average was called a permanent standard.

Incidentally, work orders in this group, that were done on a "regular" schedule, were typed by a clerk from prepared lists, and kept by the time clerk for a month. Each time the job was done an additional entry was made. This cut down on paper work required of supervisors.

Repetitive job standards were computed the same way. Non-estimated jobs were posted on a work sheet, but had no "standard." They were allowed actual for standard. We try to limit these jobs to closely supervised jobs of emergency or experimental nature.

Processing Estimated Jobs

Estimated jobs are posted on the same type of sheet, and the estimate set as the standard. These are jobs that have been pre-planned as building partitions, installing new machinery, making repair parts or machine components, etc. The procedure on this group varies from the others. The craft foreman makes one estimate of hours for the job, and it is checked by the maintenance engineer or his assistant. The code is applied to each work order written on this job, and the estimated hours appear at "E.H." on the posting side of the form.

All estimated job orders are checked by the maintenance clerk every day, after the previous day's work has been posted. When 25 per cent of the estimated hours have been spent, the supervisor is notified on an "estimating memo sheet." If, in his opinion, the portion of the job done compares favorably with the time spent, he approves the sheet and returns it to the clerk to file. If he feels it is in error, either too high or too low, he requests a revision of the estimate and states his reasons.

After approval by the maintenance engineer the job estimate may be changed to meet the conditions as found. This review procedure is repeated at 50 per cent and 75 per cent of job completion. The reason for this system is to measure performance of the craftsmen against some standard and since, in this case, the standard is an estimate of a one-time job of some duration, it seems only right that the supervisor should review the estimate as the job progresses. Most jobs of this nature involve changes or unforeseen needs as they go along. No change in estimate is allowed after the 75 per cent point.

Non-repetitive jobs are all those which do not fall in one of the four previous categories. The greater number of jobs will fall in this class. Daily work sheets for this group include the three-word description for each entry. The foreman's estimate on receipt of the work order determines the code. He has only to decide: "Will this job fall between 0 and 8 hours?; or between 8 and 16 hours?"

A standard is set for each group for each craft by dividing the total

hours in each group by the number of entries. The earned-hour standard, then, is the time it takes to do the average job, in say, the 0 to 8 hour group which, in our case, turned out to be 2.2 for the machinists. Checks taken over various intervals during the initial 12 month period show this average to be remarkably consistent.

After the standards were set, (some temporary and some permanent) we started to compute performance and make weekly reports. Since, during this initial period, no special effort was placed on improvement, we assumed our performance should come out very close to 100 per cent—which it did. Subsequently, efforts to cut actual times by method changes, frequency changes and closer follow up resulted in a rise in this figure which was a measure of the economy of such changes.

Work Orders Are Tabulated

All work orders closed out during a given week are tabulated, at least by the following Monday, from data on the daily work sheets. The actual and the earned hours are accumulated by job class for each craft. The easiest way we found to do this is by a printing calculator. The actual hours are recorded at the left of the tape, and earned or standard hours at right. Postings of the actual and standard hours are separated by three zeros so the total figures do not run together. After totalling, a division of earned hours by actual hours gives the performance for that job class for that craft. Two places are added to get the per cent above 100 as shown in Fig. 4.

The four digit numbers identified by the triangles, Fig. 4, are the code numbers of the jobs represented by the hours listed directly beneath; which facilitates a review if subsequent totals fail to check. The performance in this case is 111.6 per cent. These figures are then posted on a Weekly Control Work Sheet; one for each craft. See Fig. 5. This work sheet has double horizontal lines for each week; the top line for recording the current week's figures, and the bottom line for accumulated totals through the last week included.

Our reports are based on a ten-week moving average. At the eleventh week we drop the first week and add the eleventh, at the twelfth we drop the second and add the twelfth, etc. The decimal point is moved one place to the left to get the ten-week "average" hours. This is done as these figures are posted to the Earned Hour Control Report for each craft, which shows the performance for each job class for the current week and for the ten-week period. These reports are

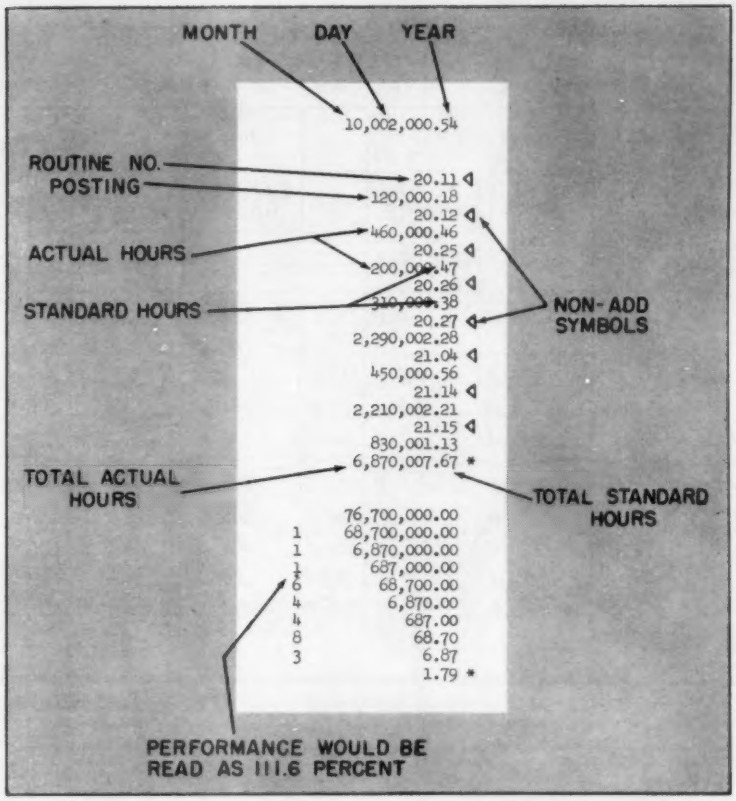


Fig. 4. A calculator is employed to record actual and standard hours. The figures on the calculator tape are then posted to a Weekly Control Work Sheet, Fig. 5

issued to the craft foremen and to the maintenance engineer on Tuesday afternoon or Wednesday morning. The gain or loss indicated refers to the previous week. See Fig. 6.

A total Department Earned Hour Control Report is made up for the maintenance engineer and any others in top management who may want to follow the progress of this activity. This shows the previous week's performance instead of gain or loss. See Fig. 7.

We now have a measure of current performance in terms of the performance of the past year. This is the yardstick we wanted!

In order to make some improvements in performance, and to realize the savings that would make this worthwhile, we assigned the co-ordinator to various cost reduction activities.

Each routine job was carefully reviewed, watched and considered by the analyst. Does it need to be done at all? Is there some part of it that can be eliminated? Must it be done as often as at present? Do we really need as many men in a team? Can we cut their hours by getting more and better tools, trucks, etc.? Can we save traveling time by combining two or more jobs in adjacent areas?

Don't be too complacent about your present procedures when you read this. We think many of you will find unexpected opportunities to reduce labor time, and hence costs, by such investigation. Remember, your routine jobs are done over and over again and many practices are habit forming. These routine jobs receive little of the department head's time and thought. His problems lie in the daily flood of new things that come up. When it's time to send a man on a job he has done many times before and there have been no complaints on quality, the foreman can send the same man again, and then forget that job.

Some Jobs Eliminated

We actually did eliminate jobs which were not needed at all. We transferred some "check up" and "inspection" jobs to production people who are near the equipment in question most of the time. We cut frequency on some from weekly to monthly; saving three-fourths of the previous cost; and saw no decrease in performance of process equipment. We checked each of these changes with

EARNED HOUR

BLACK - CURRENT WEEK
BLUE - TOTAL LAST 10 WEEKS

CRAFT Steam Fitters

WEEK ENDED	A ROUTINE (001-199) EARNED HOURS	A ROUTINE (001-199) ACTUAL HOURS	A %	B REPETITIVE (201-599) EARNED HOURS	B REPETITIVE (201-599) ACTUAL HOURS	B %	C NON-REPETITIVE (608-699) EARNED HOURS	C NON-REPETITIVE (608-699) ACTUAL HOURS	C %
1	0 0	0 0	—	0 0	0 0	—	17 2	23 2	74.0
1-12							17 2	23 2	74.0
2	0 0	0 0	—	12 9	3 9	331.0	12 0	11 1	108.0
1-19				12 9	3 9	331.0	29 2	34 3	85.0
3	53 3	48 1	111.0	8 5	12 2	70.0	165 3	158 9	104.0
1-26	53 3	48 1	111.0	21 4	16 1	133.0	194 5	193 2	101.0
4	48 2	47 9	100.0	5 3	5 6	95.0	70 6	42 0	168.0
2-2									
2-13	414	387 7	107.0		164 9	110.1	467 0	432	108.1
11	49 6	49 4	100.4	14 1	7 7	183.1	68 3	53 2	128.4
9-20	464 0	437 1	106.1	185 2	152 6	121.4	518 1	462 0	112.1
12	49 2	50 0	98.4	30 3	65 3	46.4	28 6	16 4	174.3
9-27	513 3	487 1	105.4	202 6	214 0	94.7	534 7	467 8	114.4

Fig. 5. This work sheet covers a week-to-week report. The top line of each week shows current week's figures; the bot-

CRAFT Steam Fitters

WEEKLY EARNED HOUR CONTROL REPORT

F. C. HUYCK & SONS RENSSELAER, NEW YORK

WEEK ENDED 9-27-54

	JOB CLASS	WEEKLY HOURS EARNED HOURS	WEEKLY HOURS ACTUAL HOURS	WEEKLY HOURS %	PERIOD AVERAGE (10 WEEKS) EARNED HOURS	PERIOD AVERAGE (10 WEEKS) ACTUAL HOURS	PERIOD AVERAGE (10 WEEKS) %	REMARKS
A	ROUTINE	49 2	50 0	98 4	51 3	48 7	105 4	
B	REPETITIVE	30 3	65 3	46 4	20 2	21 4	94 7	
C	NON-REPETITIVE	28 6	16 4	174 3	58 5	46 7	116 4	
D	NON-ESTIMATED	6 4	6 4	100 0	2 6	2 6	100 0	
E	ESTIMATED	140 0	127 4	110 0	67 6	54 1	124 9	
F								
G	TOTALS	254 5	265 5	95 9	195 2	173 5	112 5	
				-4.1	PERCENT GAIN OR LOSS		+12.5	

Fig. 6. The ten-week average is posted to earned hour report for each craft

those involved to explain the plan and to request their keeping a close watch to catch any ill effects as soon as possible. Surprisingly few have shown up to date.

In one particular case a large humidifying system air compressor was equipped with an oil bath air filter. This was drained, cleaned and refilled monthly on a Saturday morning because someone had said it couldn't be shut down during production hours (we couldn't remember who, when we did a little checking). Cost was two men; time per man—four hours. We arranged a trial on a weekday using some time on either side of a lunch period, and followed the men. Result: a job description of what they did and a new time—two hours!

Study of the job showed several places where added items, such as a drain valve to replace a plug, a hoist to facilitate removal, and arranging minor parts of the job to keep both men busy more of the time, resulted in cutting the time to 1.5 hours. Our original cost was eight hours at time and a half. Our current cost is three hours at straight time. This may be an unusual example in degree of improvement but it is typical of our approach. We cut many one-half hour jobs to 15 and 20 minutes.

Another example: An alteration to a machine component was ordered, by a production foreman. The foreman knew the equipment and visualized

CONTROL WORK SHEET

CRAFT *Steam Fitters*

D NON-ESTIMATED (700)					E ESTIMATED (800)					G TOTAL					PAY ROLL ACTUAL HOURS			WEEK ENDED
EARNED HOURS		ACTUAL HOURS		%	EARNED HOURS		ACTUAL HOURS		%	EARNED HOURS		ACTUAL HOURS		%				
0	0	0	0	—	0	0	0	0	—	17	2	23	2	74.0				1
										17	2	23	2	74.0				1-12
0	0	0	0	—	50	0	35	0	143.0	74	9	50	0	149.0				2
					50	0	35	0	143.0	92	1	73	2	126.0				1-19
0	0	0	0	—	140	0	106	4	132.0	367	1	325	6	113.0				3
					190	0	141	4	134.0	459	2	398	8	115.0				1-26
0	0	0	0	—	0	0	0	0	—	124	1	95	5	130.0				4
										583	3							
19	3	19	3	100.0	586	0	448	8	130.1	1657	8	1482	7	116.0				2-13
0	0	0	0	—	0	0	0	0	—	132	0	110	3	119.7				11
19	3	19	3	100.0	586	0	448	8	130.1	1792	6	1519	8	116.4				2-20
6	4	6	4	100.0	140	0	127	4	110.0	254	5	265	5	96.0				12
25	7	25	7	100.0	676	0	541	2	125.0	1952	2	1735	3	112.5				2-27

tom line records accumulated totals through the last week included. Totals are transferred to reports, Fig. 6 and Fig. 7

what was to be done. He coded the work order as 8 to 16 hours, thinking in his own mind it should take about 10 to 12 hours. When finished, the actual time was 21 hours. We went with him to look at the job and laid out a step by step procedure of what had been done; and he inserted his estimate of time for each step. It added up to 9 hours. We then checked with the man and found he had been told by production at "about" what angle two bracket pieces were to be welded on, but to try one piece first for them to check. He did this only to find they then wanted it a "little more this way." Result, a second removal, cutting, re-welding, and re-installation. An allowance was added for this extra work and we came up with 14 hours. Where did the other 5 hours go? The man could only hang his head and say he didn't know.

A few like this—and the feeling that "no one is checking" begins to wane. We now feel that "lost time" due to bull sessions, sitting out a job, etc., has decreased materially and our performance on this class bears out our feeling.

A closer check on estimated jobs has sharpened our estimating ability and made us look, more often, for things that come up during a job that will throw us off. These are considered as they come up instead of on a "Monday morning quarter-back" basis, as they used to be.

F. C. HUYCK & SONS

MAINTENANCE DEPARTMENT—EARNED HOUR CONTROL REPORT—WEEK ENDED 9-27

#	(CRAFT)	PERIOD AVERAGE (10 WEEKS) EARNED HOURS	ACTUAL HOURS	%	% PREV. WK.	REMARKS
1	MACHINISTS	468 5	466 7	98 2	92 6	
2	ELECTRICIANS	274 6	278 4	100 4	99 6	
3	CARPENTERS	328 1	319 1	100 8	100 0	
4	STEAM FITTERS	195 3	198 5	112 5	116 6	
5	PAINTERS	81 8	77 8	105 1	104 5	
6	YARD MEN	219 6	202 0	108 7	111 1	
7						
8						
9	TOTALS	1544 8	1522 5	101 0	102 0	

	JOB CLASS	PERIOD AVERAGE (10 WEEKS) EARNED HOURS	ACTUAL HOURS	%	% PREV. WK.	REMARKS
A	ROUTINE	373 3	367 6	101 6	103 7	
B	REPETITIVE	178 6	169 1	105 6	108 0	
C	NON-REPETITIVE	488 0	499 8	98 0	97 4	
D	NON-ESTIMATED	109 6	108 6	100 0	100 0	
E	ESTIMATED	395 3	386 9	102 2	104 2	
F						
G	TOTALS	1544 8	1632 5	101 0	102 0	

Fig. 7. This report shows previous week's performance for each craft, job class

Ground inside the polyethylene film "tent" never froze even though temperatures dipped to 6 F outside the covering

Building in a Sausage Casing

Indiana Turnpike Contractor's Cold-Weather Tent Speeds Job

POLYETHYLENE film is finding its way around the construction sites in this country at an accelerated pace. One of the most recent appearances made by this versatile refugee from outside a frankfurter is on the route of the upcoming Indiana turnpike.

Several thousand yards of the material, polyethylene film which comes in 20 ft rolls, were used in constructing the covering, according to C. J. Pankow, vice president of Sollitt Construction Company, South Bend. It is translucent, retains heat inside the building, does not tear easily even in cold weather, and is easily patchable should someone ram a 2 by 4 through it. All buildings are heated.

Ten of these service areas will be built by Sollitt (they are combination restaurants and filling stations) in addition to five maintenance buildings, and the polyethylene film will be used in construction of these units, too. The film is Visqueen, made by Visking Corporation, Terre Haute, Ind.

Several thousand yards of the polyethylene film were used in covering the "tent" for the entire commissary building

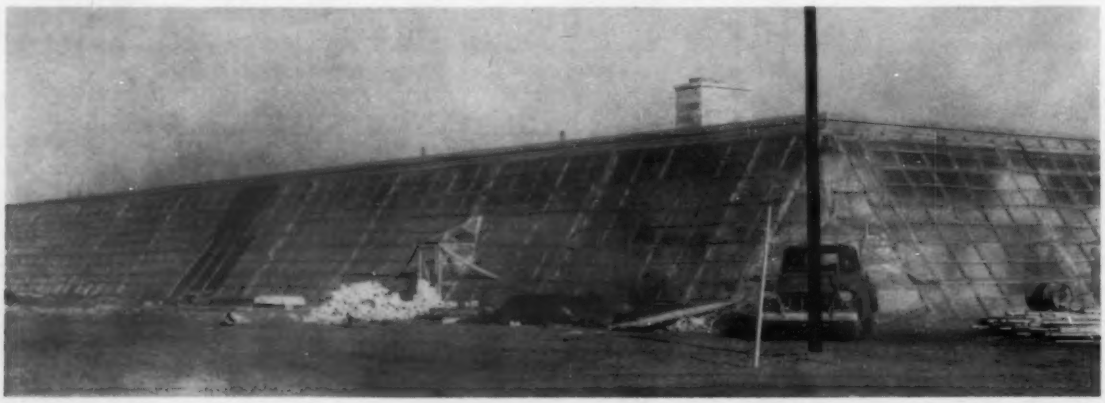


Fig. 1. Using tables from book, industrial user can quickly compute comparative installed costs of plastic and metal pipe

Plastic Pipe Gets a Handbook

Facts and Figures Compiled for Potential Industrial User

Plastic pipe is a prime factor in designing industrial piping systems . . . A basic producer has correlated physical properties and cost data on several plastic types . . . New book presents data in usable form

PLASTIC PIPE USE, mushrooming from 5 million pounds per year in 1950 to 21 million pounds in 1952 to over 33 million pounds per year in 1954, reflects its widespread acceptance.

However, dissemination of information on plastic pipe, its applications and limitations, has not kept pace with the rapid growth of the market. The lack of clear, informative data on physical properties, mechanical strength, corrosion resistance and price advantage has often proved both confusing and discouraging to potential buyers of plastic pipe.

After considerable editorial and technical research, the Monsanto Chemical Co. has recently published a 64-page book which sets forth the results of authoritative studies on plastic pipe. Titled "Pipelines To The Future," the book provides an excellent starting point for further investigation of the characteristics of this comparatively new construction component. It contains information on the fundamentals of plastic pipe, a discussion of the existing advantages and limitations of each type of pipe available, a comparison with metal pipe, and a survey of present and future markets for plastic pipe.

In general, plastic pipe has an advantage over metal pipe because of its resistance to rust, corrosion, chemical and electrolytic attack, ease and economy of installation. Long lengths and flexibility which eliminate some fittings, favor plastics, as do minimal solid deposit collection, low frictional losses and turbulence and low capital investment in equipment to produce the pipe.

The major disadvantages of plastic pipe are its lack of high temperature and pressure resistance, high cost due to high basic resin cost, conversion and market development expense and poor mechanical strength and dimensional stability.

Since the properties of plastic pipe depend on the plastic and formulation used in its construction, the characteristics of the plastics used for pipe are analyzed in the book. This analysis is reproduced in Table 1, on following page.

Caution must be exercised in the application of plastic pipe where temperature and pressure are factors. The

(Text continued on page 95)

Want a Copy?

"Pipelines To The Future" is available to interested readers of PLANT ENGINEERING from C. Judd Holt, Public Relations, Plastics Division, Monsanto Chemical Company, Springfield, Mass., for $1.00 a copy. Requests should be made directly to Mr. Holt.

Table 1. Plastic pipe can be fabricated from several types of plastic resins. Major types, with characteristics, are listed

1. POLYETHYLENE

Characteristics—
Polyethylene resin is used in the production of between 80 to 90 per cent of plastic pipe sold. Polyethylene pipe is very flexible when molded in thin section but becomes increasingly heavy and stiff as the wall thickness is increased. Its primary advantages over metal are:
- Lighter weight (lightest of plastic materials used for pipe)
- More flexible
- Ease of coupling by use of slip sleeve and clamp
- Fewer fittings required and therefore lower installation cost
- Corrosion resistance
- Ease of manufacture
- Low cost

Its major disadvantages are:
- Low working pressures and operating temperatures
- Low rigidity for interior use
- Uselessness for petroleum service (dissolved by hydrocarbons)
- Low abrasion resistance
- Slow ignition and burning
- Degradation by ultra violet light
- Low softening temperature
- Lack of desirable properties for many chemical industry applications

2. CELLULOSE ACETATE BUTYRATE

Characteristics—
Cellulose acetate butyrate represents an estimated 6 per cent of the present plastic pipe market. These resin formulas can produce pipe that will have a hardness range from flexible to extreme brittleness. Its primary advantages are:
- Excellent resistance to weathering and sunlight
- Corrosion resistance
- Flexibility of resin formulations
- Ease of coupling
- Light weight
- Transparency
- Reasonable cost

Its major disadvantages are:
- Low working pressure
- Low operating temperature
- Lack of imperviousness to aromatic hydrocarbons (artificial gas)
- Brittleness at low temperature
- Insufficiency for tough chemical applications involving strong acids, strong alkalis or organic solvent

3. POLYSTYRENE COPOLYMERS

Characteristics—
These high impact styrene resins are made as copolymers of styrene-butadiene and acrylonitrile and were used to produce 6 per cent of the 1954 plastic pipe market. Polystyrene copolymer pipe can be used for the same applications as cellulose acetate butyrate without the brittleness of the butyrate pipe at low temperatures. Its primary advantages are:
- Non-brittleness at low temperature
- Corrosion resistant, especially to chlorine-containing compounds
- Light weight

Its major disadvantages are:
- Low working pressure
- Low operating temperature

All of the other plastics used for pipe share about 2 per cent of the market. The plastics in this group are discussed below.

4. RIGID (UNPLASTICIZED) POLYVINYL CHLORIDE

Characteristics—
Rigid polyvinyl chloride is the newest plastic to enter the American plastic pipe market. Many engineers believe that rigid vinyl has the greatest potential market application of the thermoplastic materials if and when its extrusion problems can be solved. Vinyl pipe has been used extensively in Germany since 1935 by chemical plants and for water service. Its primary advantages are:
- High impact strength
- Highest tensile strength of the thermoplastic resins
- Wide operating temperature range
- Good dimensional stability
- Weathering properties
- Excellent resistance to oxidizing agents like sodium hypochlorite, to chlorides, and to several of the strong acids

Its major disadvantages are:
- High temperature and pressure limitations
- Extrusion difficulties in fabricating uniform walls and smooth surfaces
- Higher weight (50 per cent heavier than polyethylene)
- High cost
- Poor resistance to many organic solvents

5. VINYLIDENE CHLORIDE

Characteristics—
Vinylidene chloride was the first industrial application of plastics as a pipe material. Initially, this pipe found wide application in chemical plants but recently has been supplanted by other more desirable plastics. Vinylidene chloride does have an established market as a metal pipe lining. Its primary advantage is:
- Corrosion resistance especially to salt solution and dilute acid and caustic solutions

Its major disadvantages are:
- Low working pressure
- Low operating temperature
- Tendency to cold flow
- Brittleness at low temperature
- Limited standard fitting sizes (maximum of two inches)
- High cost
- Lack of corrosion resistance to strong alkalis, aromatic and chlorinated solvents

6. POLYESTER (GLASS FIBER REINFORCED)

Characteristics—
Polyester-glass fiber pipe, a thermosetting type, has the highest working pressure and operating temperature specifications of all plastics. Much development work is being done on polyester-glass fiber pipe by both the plastics industry and the steel industry. On a pound basis reinforced polyester is stronger than steel pipe. Its primary advantages are:
- Corrosion resistance
- High tensile strength (working pressure)
- Wide operating temperature range
- Light weight when compared with metal
- No cold flow
- Ease of installation and maintenance

Its major disadvantages are:
- High cost, although it does exclusively satisfy certain specific needs
- Lack of adequate fittings
- Loss of fiber due to erosion
- Resin weakness without the reinforcing mat
- Degradation of resin
- Lack of chemical resistance to strong alkalis
- Loss of strength with continued immersion in water

7. PHENOLIC ASBESTOS

Characteristics—
Phenolic asbestos is another thermosetting type which has high temperature resistance for a plastic material but low strength. Its primary advantages are:
- Extreme range of corrosion resistance properties
- Wide operating temperature range

Its major disadvantages are:
- Low working pressure
- High pipe cost
- High fitting cost

8. OTHER PLASTICS

a. Epoxy glass-reinforced—An oil company is promoting this plastic. Epoxy resins may supplant the polyesters as a pipe material since many of their properties are better than those of the polyesters. Present total production capacity is 35 million pounds per year.

b. Tetrafluorethylene—Fluorcarbon is a material similar to polyethylene except that hydrogen atoms have been replaced by fluorine. This plastic is made into pipe for carrying concentrated acids and caustic at elevated temperature (400° F). It can not be made by extrusion and the cost is prohibitive for all but a few extreme condition installations.

c. Nylon—Cost of pipe is too high for large scale commercial installations.

d. Methyl methacrylate—Used for special applications where visual observation of the fluid flow is necessary.

e. Phenolic—Plastic pipe fabricators are continuing their studies of phenolic extrusion. Brittleness of phenolic pipe will limit its use.

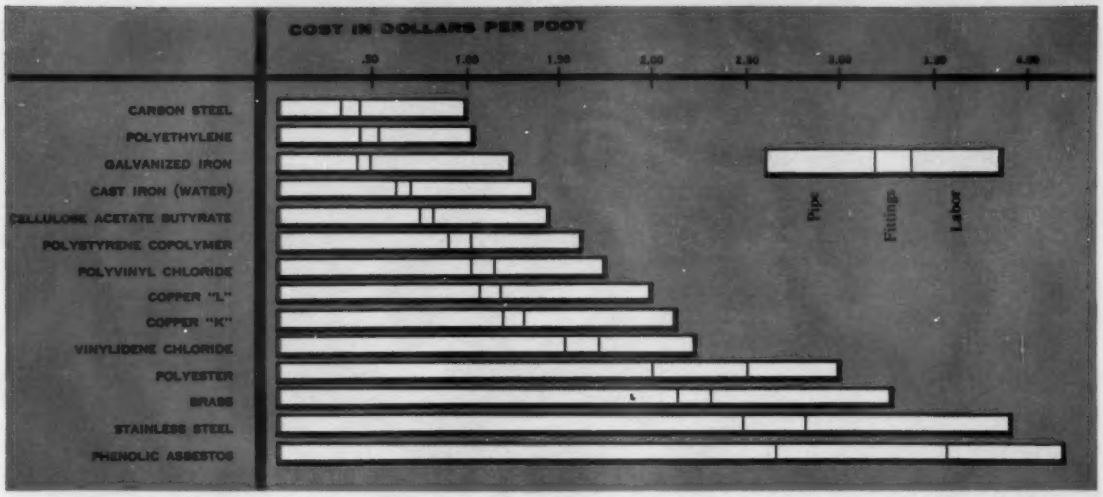


Chart 1. With bars divided into cost components pipe, fittings and labor, chart shows comparative costs of installed pipe

allowable working pressure of thermoplastic resin type pipe varies inversely with the temperature. The thermosetting resin type pipe can safely withstand another 100 degrees of temperature, compared to the thermoplastic, but it is extremely brittle and has low pressure limitations unless reinforced with glass woven mats. These temperature and pressure limitations are tabulated in Table 2 which is reproduced from the book—as is Chart 2, below.

Cost comparisons, too, are well presented in both tabular and bar chart form. Ratios of installed costs to pipe costs have been formulated, and these are used to determine relative installed costs of metal and plastic pipe, for the same installation.

Table 2. Tabulation of allowable operating pressures at maximum temperatures

	Maximum Working Temp. F	Allowable Pressure psi
Carbon Steel	650	500
Polyethylene	160	25
Galvanized Iron	650	500
Cast Iron	300	150
Cellulose Acetate Butyrate	150	65
Polystyrene Copolymer	170	60
Polyvinyl Chloride	180	55
Copper "L"	406	198
Copper "K"	406	235
Vinylidene Chloride	175	25
Polyester	275	120
Brass	406	394
Stainless Steel	650	725
Phenolic Asbestos	265	65

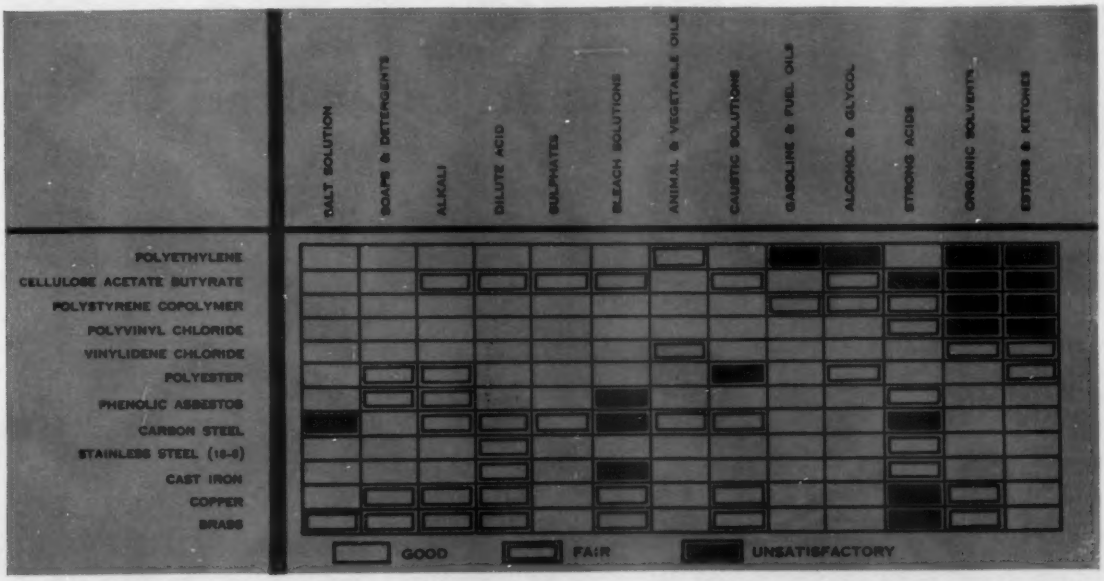


Chart 2. With chemical resistance a prime factor in pipe selection, chart shows resistance of pipe materials to chemicals

Photos: Fig. 1. Courtesy Miskella Infrared Company; others, General Electric Company

Fig. 1. Above: Portable oven used by Wean Manufacturing Company for expanding bearing assemblies. Formerly, the company used infra-red bulbs

Fig. 2. Right: Comparative sizes of 1000-watt (top) and 500-watt lamp

Quartz Lamps Expand Infra-Red Uses

TUBULAR QUARTZ infra-red lamps, which have been developed as a source of radiant energy, permit of so much greater concentrations of heat than have heretofore been practicable that the possibilities of this method of heating have been greatly broadened. This is due to: 1. The fact the quartz is able to withstand a much higher temperature than conventional glass lamps; 2. Because tubular quartz lamps take up much less space and can be placed closer together; 3. The lamp's ability to withstand thermal shock, such as splashing of cold water on its surface.

One good example of an application of this lamp is a portable oven used by Wean Manufacturing Co., Warren, Ohio. It is equipped with twelve 1000-watt quartz infra-red tubes and is used to expand bearing assemblies before placing them on shafts. This oven is shown in Fig. 1. The oven has six switches on the outside for controlling the lamps, and perforations in the sides for cooling ends of tubular lamps.

Formerly Wean Manufacturing Co. heated bearings by means of conventional infra-red bulbs. However, this type of equipment used up much of the space available inside the oven so that the size of pieces to be heated was severely limited. Also, it was not practical to make the oven larger because it could not be moved around the plant so conveniently. Consequently, when the tubular quartz lamps became available they were installed in a new oven. Wean can now heat parts which are twice as large as those formerly heated with less time, labor, expense.

These 1000-watt quartz lamps have an overall length of 13 13/16 in. and a lighted length of approximately 10 in. with an outside diameter of ⅜ in. The required circuit voltage is 230 to 250. Both the 1000 and 500 watt lamps are shown in Fig. 2. The circuit voltage for the latter is 115 to 125; its outside diameter is ⅜ in. and overall length is 8 13/16 in. It has an approximate lighted length of 5 in.

An interesting use of the 500 watt lamp is shown in Fig. 4. This is an oven designed especially for shrink-fitting pinion gears onto the armature shafts of traction motors. Both the armature shaft and pinion gear are tapered, tolerances are close and it is

necessary to regulate the temperature to a fine degree.

This newly-developed oven is equipped with four fixtures each containing two 500-watt, 115 to 120 volt quartz lamps with Alzak reflectors. The eight lamps are connected in parallel and draw about 33 amp. In tests made at two railroad shops a 17 tooth pinion gear was heated to 360 F in less than 15 minutes and a 23 tooth pinion in less than 30 minutes. The difference in temperature between the pinion bore and the outside surface of the teeth was less than 10 deg.

What the foregoing figures mean in saving of time and improvement of work quality is shown by comparison tests. In these tests pinion gears of 21 teeth were heated by one of the conventional methods such as gas or oil-fired ovens or—more frequently—by induction heating or radiant energy. Heating by the conventional method for 22.5 minutes raised the temperature inside the bore to 170 F. During the same period of heating by radiant energy the temperature inside the bore was raised to 322 F.

Among the advantages of these lamps is the almost instantaneous warm-up and cooling of the units. Equally important is the accurate control which it is possible to exercise over the temperature rise of a metal part which is being heated. An oven like the one shown in Fig. 1 is light enough for one man to carry from place to place and it can be operated on any 115 to 120 volt circuit. The cost of the power consumed is very low: about 2c for heating the 21 tooth pinion gear just discussed. Maintenance costs are almost negligible. The quartz lamps have a normal life of better than 5000 hours.

In designing these ovens for specific purposes the connections for the lamps can often be for parallel, series-parallel or series operation, according to the voltages available and the heating intensities desired. They are relatively inexpensive to build.

Quartz lamps are being used for the very high concentrations of energy in connection with aircraft research where it is desired to simulate the skin temperature rise in supersonic flight. To attain such high concentrations of energy the lamps are closely spaced, often as close as ½ in. centers. Two banks of lamps may be used, with those in the rear bank positioned between those in front. They are usually operated for only 1 to 5 seconds at double rated voltage, and since full output is attained almost instantaneously measurements may be started at once. Some of the more recent applications use 2500 and 5000 watt quartz lamps. Shown in Fig. 3 is an elaborate installation using 1000-watt clear quartz lamps which can be adjusted to the different aerodynamic contours.

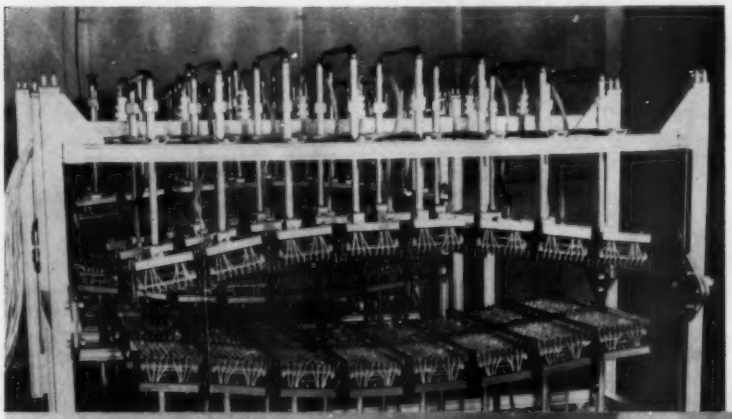


Fig. 3. Left: Installation of quartz infra-red lamps which can be made to conform to aircraft wing contours. Heat generated simulates that developed on wing surfaces in supersonic flight

Fig. 4. Below: An even smaller portable oven used for shrink-fitting pinion gears onto armature shafts of motors

Fig. 1. Photograph at the left shows the atmospheric conditions in this hat plant even with good steam vapor removal. It doesn't take too much imagination to realize the almost-impossible conditions that would exist without engineered ventilation

Steam Vapor Removal—

Case Study from Tough School: Hat Manufacturing

By A. T. LEE, Chief Engineer in Charge
Battersby and Company, Ltd., Offerton Works, Stockport, Cheshire, England

STEAM REMOVAL does not directly produce any goods; it is conducted primarily for the comfort of the employees and for the protection of the fabric of the building. It is obvious that if workmen are producing under good conditions they will work better, and so produce more.

If it is just a question of removing the steam from a department where no manual work is being done, it is a comparatively simple matter. All that is necessary is to raise the temperature of the department sufficiently to dissipate the steam and to change the atmosphere, say about 20 times per hour, by ventilating fans.

On the other hand, if people are working manually in the department, then the above method will not be satisfactory, as the temperature of the department will be too high. The temperature and air flow would have to be balanced so that abnormal temperatures would not be possible.

Boiling Water Demand

One of the departments in our plant has a capacity of 163,016 cu ft. About 78 people work in the department on various types of machines, all using boiling water. The water is boiled by open type coils, i.e., direct injection of steam. The vats are all of different size groups with a total area of boiling water of 268 sq ft.

It is estimated that boiling water gives off about 7½ lb of vapor per square foot per hour (although this figure is a variable one, according to steam pressures, etc., but is satisfactory for our calculations). A further 2½ lb is allowed for steam rising from trenches and pits due to run-off and spillage. The total amount of vapor being given off is, therefore, 2,680 lb per hour. Of this, however, the steam from some of the vats was led directly to the outside atmosphere by means of ducting, so that the total amount of steam left in the department was in fact 1,250 lb per hour, plus any steam that did not directly go up the ducting.

On a cold day, this amount of steam is sufficient to make it impossible to find one's way about the department, the whole place is blanketed by vapor in about five minutes if the steam removal plant is not working. Conversely, the steam can reasonably be removed in about five minutes with the plant working and visibility restored to something like normal.

The reason for boiling by direct injection, and not closed coils trapped, is that not all the vats have to be boiling at the same time. Some may be working as low as 60 F so linking up the vats is well-nigh impossible.

So much then, for the steamy atmosphere. How we remove it is as follows:

We have four 36 in. propeller fans let into the walls as high up as we can safely get them. In the roof bays (which have dormer roofs with hardboard slides which can be opened during the summer months) we have four 24 in. fans—again propeller types—with self-closing doors on the outside. Down the center of the department at a slightly lower level than the extraction fans, we have a 35 in. Multivane type fan with heater battery in front of fan and ducting running the length of the department, with outlets progressively smaller. This fan consumes about 1,200 lb of steam per hour on a cold day.

Total Heating Load

On the opposite walls to the extraction fans, we have two 36 in. propeller type fans, each with a 2-row heater battery inside the department, i.e., the fans blow through the heater units, the advantage of which will be seen later.

These two fans each consume 750 lb per hour, so that the total steam used for heating the air is 2,700 lb per hour, or about one-third of the output of one of our boilers.

As I pointed out previously, for this steam we get no goods produced. However, by careful planning, we have now reduced this steam wastage to a minimum by the following method which, I will admit, is contrary to accepted practices.

The department is fed from the boilers by a 4 in. main steam line, with 2 in. tappings taken off to each machine line. The smaller vats are fed by ½ in. open coils, the larger vats by ¾ in. coils, each with separate shut-off valves.

Steam to the two 36 in. propeller type heater units is fed at a high level direct from the 4 in. main by a 2 in. pipe which splits up into two 1¼ in. pipes, one to each row of heater tubes. The outlets run into a common return fitted with a non-return valve and thence back into the main 4 in. steam line at a lower level. This is done in such a manner that the flow in the main line induces a flow in the common return, so that no steam from these units is wasted.

By doing the job this way, we have not only saved steam, but also water for process. Also, we have obtained better production owing to the fact that the condensate, which carries over with steam, more or less keeps the vats charged with soft water thus doing away with the necessity of an expensive water softening plant.

The condensate from the 35 in. Multivane fan is trapped and also

used for either process or return to the boilers.

Two other departments have been ventilated in the same manner, but the condensate in both these cases is used for process, as water in the steam in these departments could not be tolerated.

Supply and Demand

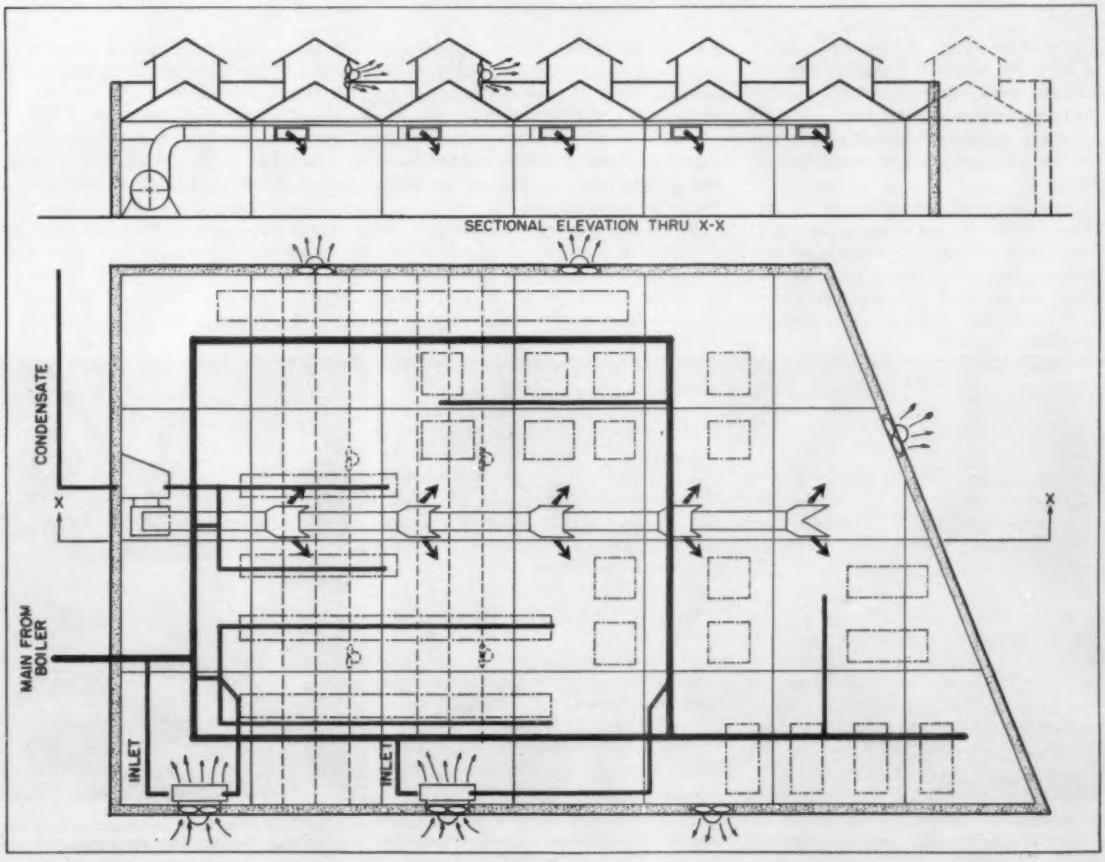
One of the advantages of the system is that the more people there are working, thus creating a more steamy atmosphere, the more steam is passed through the heater units. The unit therefore creates its own supply and demand. On the other hand, it is this demand that creates too much heat in the department, and the way we deal with this is to stop the fans blowing the heat in and allowing the extraction fans to draw in their own supply through the heater units.

Half an hour before work commences in the department, we start up the 35 in. Multivane fan, with all other fans stopped, thus creating a slight pressure in the department, with a consequent rise of temperature. We bring in the other fans as required. This system has been operating satisfactorily for a few years now, with only minor snags.

By creating a slight pressure in the department, the functioning of the ductwork was made very much better. The air in the department, being forced up the ducts in escaping to atmosphere, carries the steaming vapor with it, thus getting over the difficulty of "cold draw" common to any chimney type duct.

I may say that we have tried positive suction and other methods, but, so far, the present system has proved very definitely the best and cheapest.

Fig. 2. Plan and sectional elevation drawing of the steam supply and ventilation system at Battersby Hats



Illustrations: Factory Insurance Association

Fig. 1. Proper maintenance will insure the efficient operation of a sprinkler system. Illustration shows how the end elbow of a cross main is replaced by a tee, short nipple and cap for flushing the line

Recommended Steps to Follow When

Flushing Sprinkler Systems

AUTOMATIC SPRINKLERS, with adequate water supplies, are the most positive method of protecting property against fire. The outstanding record of sprinklers is due to their efficiency under proper maintenance.

Any material accumulation of foreign matter in sprinkler piping may constitute a serious impairment of protection. In many cases, such impairment of sprinkler efficiency has been the cause of a major fire loss in sprinklered plants.

Internal obstructions may be present in piping, without any visible evidence. Parts of a sprinkler system may be entirely clear of foreign material while dangerous deposits may exist elsewhere due to arrangement of piping and source of foreign material. The age of an installation, its maintenance and the nature of the water supply usually measure the condition of a system.

Dry pipe systems are more susceptible to obstructions than wet pipe systems due to alternate wetting and drying of pipe, causing pipe scale, and due to the sudden rush of water filling the system when a dry pipe valve trips. Generally, any dry pipe system that has not been tested for obstructions in over 10 years should be thoroughly examined to determine its efficiency. This is also true of any dry or wet pipe system having water supplies subject to accumulation of sediment or foreign material which has not been tested for obstruction in over five years. Whether or not a system needs complete cleaning will be evident from the nature and amount of deposits found on examination.

When there is reason to suspect the presence of foreign material in a system, the condition of the overhead sprinkler piping should be determined by test-flushing the small end lines through a hose and by examination of the piping by disconnecting at strategic points.

Whenever appreciable amounts of foreign material are found in a system, the source of trouble should be determined and corrective measures taken. Sometimes it is possible to replace dirty water supplies with clear water supplies. In any event, it is always possible to limit the effect of foreign material by providing a well-engineered installation and superior maintenance.

The first step in flushing sprinkler systems is to thoroughly clean and flush the water supplies and underground piping. In general, there are two principal methods of cleaning interior piping: the hydro-pneumatic method and water flushing. In both, a stream of water passing through the pipes with sufficient velocity raises the loose foreign material in suspension and carries it out of the system. It is essential that a properly engineered procedure be used in both methods. For that reason, cleaning operations should, preferably, be done by a recognized automatic sprinkler contractor.

Cleaning of a sprinkler system involves major interruptions of sprinkler protection. The insurance carrier should be notified before work is started and precautions taken.

Note the character of the water flow-

Fig. 2. After hose is connected, pressure will be applied to remove scale

ing from a hydrant butt, drain or other outlet. Where discolored water exists, examination of the foreign material caught upon a screen or in a container should give some indication of the extent of obstruction.

An abnormal drop in pressure during flow tests of sprinkler risers indicates possible obstruction from foreign material or partially closed valves, etc. Water supplies should be studied not only as they appear at time of test but as they may have been recorded during the life of the sprinkler system. Perhaps the system was installed before the filtration or water-treating plant had been built or reached its present stage of efficiency.

Observe the character of the water flowing from the end of a branch line through a small hose to the exterior.

Examine Interior of Pipe

Examine the interior of overhead sprinkler piping at strategic points on all floors either by disconnecting piping and viewing interior or by removing sprinkler heads at opposite ends of branch lines and observing interior by means of lights and mirrors, as with a Pipeoscope. This instrument is similar to a periscope and is designed to fit into any standard sprinkler fitting from which a sprinkler head has been removed, and thus enable the operator to look inside this pipe toward another fitting into which the "light source" has been similarly inserted to illuminate the interior of the pipe.

An excessive number of sprinkler heads opening during a small fire or charring of the ceiling directly over automatic sprinklers may indicate obstruction. Examine the lines in areas where heads have fused as a result of a fire, as sediment within the system may have been carried to this section.

In dry systems supplying both warm and cold areas, where warm air passes through the cold area and condenses, obstruction may occur from freezing. Interior corrosive action may be more active in dry systems that supply both hot and cold areas, due to the movement of air.

Examine, and give particular attention to, low trapped areas and nipples of pendant sprinkler heads where there is no drainage.

Obstructions at one or two heads may be serious and may result in material spread of a fire. A typical example of this was a small fire that occurred recently. Where the fire should have been extinguished by one or two heads, actually 50 heads were fused because the two heads directly over the fire were obstructed by loose pipe scale. The interior of the sprinkler piping was not badly corroded, but the fire was at the far end of the system, and when the dry valve tripped, water forced small particles of scale into the 1 in. pipe, plugging the two sprinkler heads. Thus, fire was free to spread beyond the area beneath these two heads.

Cleaning steps to follow when employing water flushing method, are:

1. Clean reservoirs and tanks; examine fire pump suction, screens, etc.
2. Flush underground system through hydrant butts, blow-off valves, or other convenient opening (at times, fire department collection may have to be utilized), endeavoring to obtain maximum possible flow at each flushing outlet.
3. Flush system at main riser drains.
4. Flush overhead piping, starting generally at the lowest floor.
   a. Flush bulk run through 2½ in. hose.
   b. Flush cross mains through 2½ in. hose.
   c. Flush branch lines through 1 or 1¼ in. hose, beginning with the line nearest the riser or supply line.

Note:—Hammering branch line piping while it is being flushed is an effective method of dislodging and removing foreign material. All pendant heads should be removed and cleaned. Dry systems should be filled with water for a day or two before flushing.

Hydro-Pneumatic Flushing

For the hydro-pneumatic flushing method, the first three steps are the same as those indicated for the water flushing method.

In the fourth step, flushing is done in the reverse direction to that employed in water flushing. A limited amount of water, backed by compressed air, is injected into the system at the ends of the branch lines. Foreign matter is forced from the smaller to the larger piping and out of the drain at the base of the system. Start first with branch lines nearest the riser on the top floor. Then clean cross mains discharging through 2½ in. hose lines at end of cross main. Next, drop to the floor below, repeating operations.

It is important to see that several precautions are taken whenever a sprinkler line is being cleaned.

Be sure to notify your insurance carrier before sprinklers are shut off and use tags to indicate the line is out of service.

Restore protection at close of the day's operations.

Make sure that as little of the system as possible is out of service.

Station a man at the closed valve so that it may be opened immediately in case of emergency.

Suspend hazardous operations in those sections where sprinklers are shut off and provide an ample supply of chemical extinguishers.

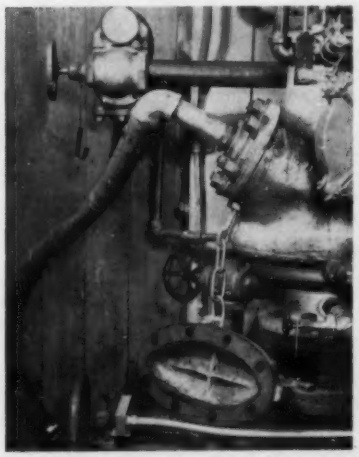


Fig. 3. Dry pipe valve is removed and temporary cover, drain line are attached

Fig. 4. This hydro-pneumatic unit is used to flush systems. The top tank contains water; and the bottom tank, air. Portable air compressor is shown at right

Fig. 1. Towing conveyor travels along level ground, also up and down ramps which connect floor levels 15 ft apart

Conveyor Tows on Two Levels

Brings Order and Simplicity from "Fine Frenzy"

By **RAY MANSFIELD**, Materials Handling Engineer, Zenith Radio Corporation, Chicago, Ill.

THE JOB of picking up a package and putting it down again is no simple problem in a manufacturing plant the size of our headquarters at 6001 W. Dickens Avenue in Chicago. Hence, it is understandable that more than a year's planning went into the decision to install a towing conveyor system that handles both lateral and vertical distribution throughout a large segment of the main plant.

The basic problem can be easily stated: provide a conveyor system that will take incoming cabinets and television picture tubes from train or truck; deliver these elements to storage; take finished and cartoned sets from production line terminals and deliver these to outgoing train or truck.

However, we were faced with the fact of an unalterable grade separation of 15 ft between the old truck loading level and the new train loading level. The main line of the Milwaukee Railroad passes immediately south of the plant, level with Zenith's second floor, and spur tracks enter the plant at that level. In fact, if the spur line were to be extended somewhat beyond its present limit, the Union Pacific's City of Los Angeles and the Milwaukee's main line Hiawatha could roar right through the plant instead of past it.

Second problem was presented by the fact that the company was in the process of expanding its plant. Part of any conveyor system would have to be installed in the midst of operating facilities; part would have to be installed during plant construction; part would have to wait until the plant expansion was completed.

In determining what conveyor method to use, the natural starting point was a study of the type and character of the loads which the system would have to convey. There is very widespread disparity in size and weight. Some finished sets may weigh up to 300 lb and bulk as large as a refrigerator—obviously an awkward package to move by overhead conveyor, let alone a difficult one for men to lift in loading and unloading. Belt conveyors and live rollers were tossed out of the consideration for other reasons; for one thing, they would pose a physical barrier to free movement around the manufacturing and shipping areas, and they did not dispose of the vertical lift problem satisfactorily. Tractor trains seemed to offer a solution until the turn-around problem presented itself.

Study Other Installations

Following a study of the towing conveyor system at the Santa Fe Railroad Corwith Yard in Chicago, we were convinced that such a method might work out successfully for Zenith, provided that the problem of two-level operation could be solved. As matters turned out, the solution hinged on redesign of the tow pin on the trucks, and the dogs attached to the chain, both worked out by our engineers, in cooperation with the Jervis B. Webb Company, Detroit, manufacturer of the Towveyor.

The tow pin they developed was considerably longer than standard. It is spring loaded, so that an individual truck can be disengaged instantly from the track by swinging the control arm clockwise out of a retaining slot. The truck is re-engaged simply by moving the tow pin over the track slot and pushing downward on the control arm against the pressure of the spring, meanwhile turning the arm to enter the retaining slot.

The dogs were redesigned principally to give more pin bite. Three-fourths of an inch is standard for the bite on a level carry, but the floor-to-floor grades to be encountered in our plant required dogs that were 1¾ in. in bite. Dogs are paired facing each other with 1½ in. clearance between the faces. Both dogs are gravity balanced and ordinarily maintain a position with faces vertical to the track. The down-track dogs operate as pushers; up-track dogs depress to receive a truck tow pin, and then swing up to normal position where they act as holders against a down grade roll.

While design of the pin and the engaging elements was the key, there were several associated problems, such as ramps and turn arounds. These tied in directly with the design of the trucks. After considering sample trucks from a number of manufacturers, the company settled on a design that was a modification of a truck

submitted by the Thomas Truck and Caster Company of Keokuk, Iowa. Basically, this is a 3 ft by 6 ft four-wheel truck, with solid rubber tired wheels. The rear axle is fixed and the front wheels are swivel type. Bed of the truck is ¾-in. maple with a surrounding steel frame. Rated load capacity is 2,000 lb, considerably in excess of the normal loading.

Because portions of the plant addition would be in service before full completion date, the trucks were equipped with automatic couplers and were used in tractor trains for a time. They are still used that way occasionally, but more often the couplers are a convenience for attaching to a fork truck, particularly at train loading and unloading points.

Truck sizes were dictated not only by over-all load weight, but by aisle and doorway widths, available space for turn-around, etc. Also the dissimilarity in size between units of one load and another required special construction. There are 12 stake pockets in each truck bed and these are so spaced that the standard end racks can be switched to become side racks, thus functioning as an easily assembled box truck. With this type of arrangement, small portable radios or large size TV-phonograph console combinations can be handled on the same basic truck.

The physical makeup of the "right-of-way" was based on observed experience with other installations. We found that rubber treads were to be preferred and that the concrete roadbed must be very dense and wear resistant. Two separate paving jobs resulted. In older portions of the building, a roadbed was cut out of existing concrete. After the conveyor track was set in place, spaces on both sides were filled with ready-mix concrete to which iron dust was added on the job as laid. Power trowelling produced an intensely compact and smooth surface.

In the new addition, the structural floor was brought to within ¾ in. of finished grade, and the truckway filled with special concrete based on the addition of very hard trap rock aggregate. Power trowelling was used to finish. After more than a year of service, there is no surface wear apparent.

Prior to installation work at the main plant, all turns for the system were laid out experimentally on the second floor of our Kostner Avenue plant. It was determined that a 6-ft radius would serve the various bulb turns. Column clearances were also worked out and detailed studies were made on the radius required at top and bottom of the ramps to avoid pull out. A 120-ft radius was the one settled on—a curve that required a good

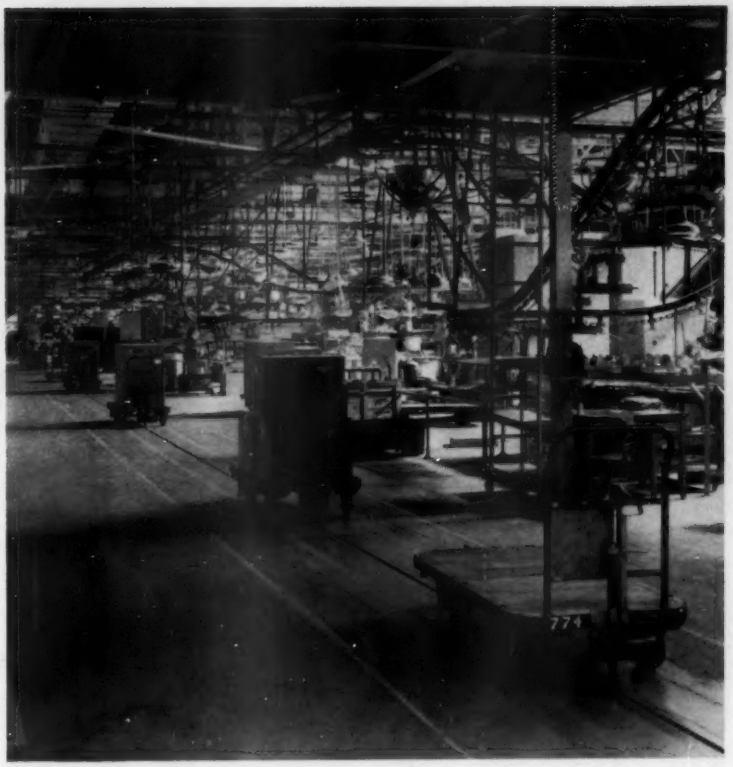


Fig. 2. Trucks travel on conveyor through plant from assembly to shipping

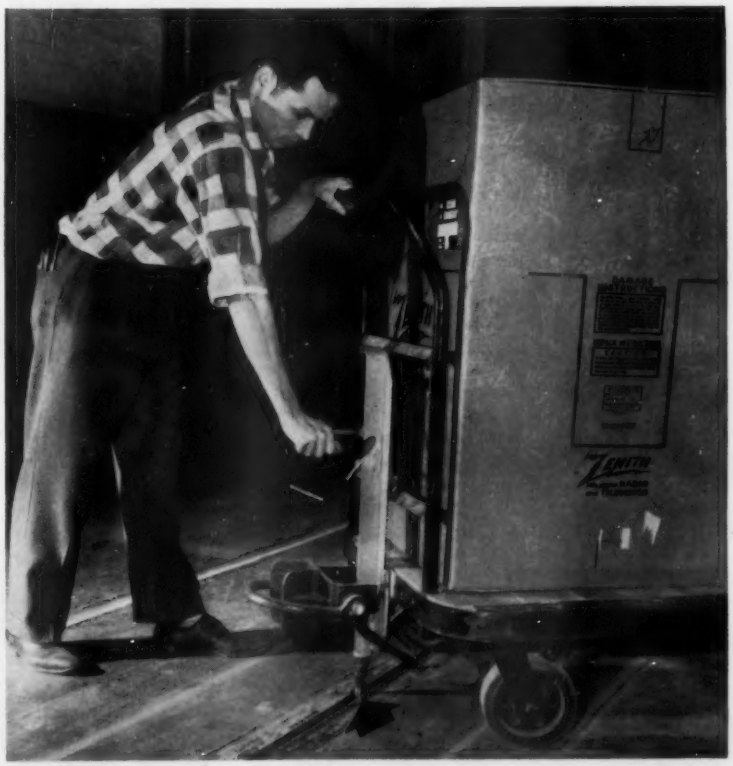


Fig. 3. Redesigned pin (arrow) improves truck stability on ramps and curves

Fig. 4. Truck waits in tracks at end of conveyor line ready to receive cartons

deal of precise, transit controlled measuring when the ramps were finally built. These ramps are 192 ft long, and in a couple of useful locations are wide enough to accommodate fork truck passage from floor to floor as well as the Towveyor.

The basic system is 3,870 ft long, and when operating full, conveys 193 trucks on 20-ft centers. Horizontal speed of 150 ft a minute is maintained by three separate 20hp, 220v, three phase motors. Motors turn at 1,750 rpm and operate a speed reducer through belt drive. The speed reducer in turn drives a caterpillar chain which meshes with the towing conveyor line.

In order to provide for local problems or emergencies that may occur along the line, the entire system can be stopped or started at any one of 36 station points. Off-on switches located on the ceilings are operated by overhead drop cords, and these cords are color coded, green for start and red for stop. The system can also be stopped or started from a master control panel located in the shipping office. This panel is equipped with an indicator box that tells the location of whatever emergency station may have stopped the line. An electrically operated stop counter and clock at the shipping office also tell instantly the total number of stops made during a given period and the accumulated length of time the line has been operating. At the outset, stoppages were much more frequent than at present, not due in particular to difficulties with the line, but to unfamiliarity of the system to outside workmen. While construction was still going on, carpenters and others sometimes shut the line down in order to cross it.

Maintenance Is Minor

Maintenance problems have been minor. In more than a year of operation, trucks have been in the repair shop only because of damage caused by mishandling. The running gear of the 925 trucks have been lubricated once—not because they needed it, particularly, but because we thought it would be a good idea. The chain drive is given an oiling once a month by a man who travels the line with a power oiler aboard a truck. The operation could be made automatic, but it is so relatively simple that there has been no urgent necessity to develop the machinery for it. The same is true for the drive chain. One day a month on time cue, all trucks are disengaged from the dogs. An oil barrel is placed across some point in the track, and holes are opened in the can fore and aft. The system pulls the chain around and gravity takes care of the rest.

Sweeping is also a simple operation. A standard truck fitted with four stiff bristle brooms is mounted to straddle the track. The sweeper truck is operated constantly, and in order to keep the vehicle from being used as a load carrier, a sort of tent-like plywood structure was built on top, and the entire vehicle painted a bright yellow. The topsides are used as convenient mounting boards for messages connected with our safety campaign.

The chain channel is cleaned automatically. Wipers on the chain move any accumulated dirt into clean-out pits located at every turn and along the runways. These pits are cleaned out at regular intervals.

Like any useful tool, the Towveyor has found jobs in addition to those for which it was designed. One of the first, of course, was to transport line fills to the various assembly lines. It also became useful to transport janitor trucks. Modification of the basic truck design was required for this purpose. A punched steel superstructure was built to hold cleanup trash, but as joints in the truck beds opened up, a certain amount of dirt sifted through to the track. A solid metal bottom for the superstructure cured this trouble.

The trucks also convey empty cartons, in which TV picture tubes are received, to the baling room and then convey finished paper bales to one of the shipping docks. On occasion, they carry special engineering apparatus, some of it quite heavy. However, the basic, workaday chore is to convey incoming cabinets and tubes to storage, and finished sets to shipping. The line is designed to handle 10,000 units each way, and could enlarge this capacity considerably with an increase in the drive speed.

A number of safety rules were required, but these can be classified as ordinary precautions to prevent injury not only to employees but to the system. Truck riding is prohibited, and so is walking on the ramps. The conveyor route is clearly marked throughout with parallel red and yellow stripes, and any kind of obstructing material is required to be kept back two feet from the pathway. Trucks have the right-of-way over employee crossings, and nobody except authorized personnel is permitted to engage or disengage a truck from the line.

Orderliness and simplicity of the system have been major contributions to plant efficiency. In particular, we appreciate the improvement over the tractor train which "took 32 fork trucks, six cops and eight traffic lights to maintain a fine frenzy," according to one engineer.

Plant Engineer Bud Pasnow

Chief Industrial Engineer Bob Cole

Maintenance Foreman John Podgurski

Longren's Production Team —

How It Slashes Production Time, Raises Plant Efficiency

JUST HOW MUCH cooperation ordinarily exists between plant engineering, industrial engineering, production engineering and maintenance engineering? Usually, plant engineering and maintenance, being under one head or in one department, work harmoniously. In a few plants (See "Magnavox' New Organization Coordinates All Engineering Activities," March, 1954, page 90) industrial engineering and plant engineering are headed up by one man.

In some plants, on the other hand, the areas of responsibility are either undefined leaving a no-man's land where few care to tread; or the lines of demarcation may be so pronounced that no department head will risk trespassing in the domain of another.

It's different at the Torrance, California plant of Longren Aircraft Co. Here, all parties keep an eye on expenses and on production.

Outwardly, this teaming may appear part and parcel of Longren's long-time bonus plan which distributes 24 per cent of net profits quarterly to employees—be they engineers or electricians. The bonus makes "production" everybody's business. Actually, the bonus incentive is but one factor in Longren's revitalized role for maintenance.

A typical result of Longren's teamwork is the recent realignment of an assembly department, its 78 assemblers and two dozen machines.

Pre-planned by an integrated team —Bud Pasnow, plant engineer; Bob Cole, chief industrial engineer, and maintenance foreman John Podgurski —the realignment more than halved assembly time (of an aircraft wing pod). Eliminated were costly "premium" overtime hours. Stepped-up efficiency allowed shifting of these assemblers to other jobs. What's more, maintenance cut itself in for 24 fewer hours of work weekly—because the layout, in streamlining materials flow, made routine maintenance easier. To top it off, the department was realigned over a two-day weekend — was in higher-geared production the following Monday.

Changing Production

As the "team" studied the department, there were problems aplenty. Longren, once a specialized sub-contracting "job shop", had expanded into long-term production. The changeover had been superimposed upon a department scaled to short-run jobs.

In pod-assembly, there was no real line-flow. Jigs, set-up wherever there was space, confused what flow pattern there was. A central stockroom still served the big assembly area and its 78 assemblers. Assemblers, incidentally, who had to check-out from stock even the rivets they used. Pod-fabrication was a two-jig process: the pods begun on fixed jigs, then transferred to mobile dollies. There was no pre-planned overhead piping grid (Longren uses air to power rivet guns and drills). One hundred feet in width, the department was served by a single, down-the-center aisle. Time studies showed excessive check-out time between jigs and supply room. For maintenance men "down time" was just as great. Machine placement — in some cases — prevented routine maintenance while machines remained operative. To keep production schedules, assemblers were working a 10 hour day, five days a week, and often Saturday and Sunday.

Pre-move confabbing was typical of Longren's teaming of maintenance and engineering, of combining the best from both into a layout that made maintenance as well as engineering sense:

Cole (industrial engineer): We need to decentralize the stockroom. adopt a line stock system.

Pasnow (plant engineer): Yes, and install standardized cabinets for rivets, standardized racks by each machine. They'll speed up production, cut out trips to supply.

Podgurski (maintenance foreman): Line stocking should save us money, in two ways. With just a few standard cabinets, my carpenters can turn them out faster. Way it is now, when some stock's deleted from specs, its cabinet becomes salvage... costs us money and time.

Pasnow: What type of cabinets?

Podgurski: Steel-drawered cabinets lined up along the aisles, "mothered" into the machines they serve. Maybe a central cluster of standardized, adjustable-shelved cabinets—say 5 ft high, 30-in. wide, with shelves adjustable in

6-in. increments—for sheet and shapes.

Cole: Standardized cabinets will save assemblers' time—but what about shift clean-up?

Podgurski: Ought to be easier if anything... especially if we provide cabinet space for the air tools. My maintainers complain that some assemblers stow tools on the floor, under jigs. It's time-consuming, sweeping around them. Let's get them off the floor and into cabinets.

Cole: (studying template layout of proposed realignment): Let's move this hydropress over here...

Pasnow: Better idea, I think, is over here...at least away from the door...away from moisture. Besides, the floor slab's only 4-in. there. Over here it's 6-in. and reinforced. We can cut out building an expensive foundation.

Podgurski: (chuckling) Did a little time studying myself... on equipment located near a door. Maintenance costs are too high, and that press is pretty delicate...

Cole: OK, now, what about this power shear? Time-studies show it ought to be moved, made a first-operation tool, precutting stock before it reaches the line.

Podgurski: Getting it away from the assembly floor will keep cuttings isolated, reduce clean-up time in the assemblage area.

Cole: What about its new foundation?

Pasnow: I figured cost at $200.

Podgurski: That's what it'd cost us to build it. But the shear's going to be moved to the new Torrance airport plant in 4-5 months. Couldn't we skip the foundation?

Pasnow: I'm pretty sure we can. The floor's 6-in. reinforced there. Set the shear on a ½-in. steel plate, and lag it to the concrete, and we'll have a low-cost temporary base.

Podgurski: And higher production on the line, pre-forming parts like that.

Cole: It'll save all around—that temporary base, still give us a production step-up.

Outcome of this teaming for higher production saw the department realigned. Jigs (10 of them) were aligned along one of two aisles. Engineering had found a way to eliminate the wing-pod's transfer from permanent jig to dolly. Meantime, maintenance fabricated standardized line-stock cabinets, one for each jig, and others, for odd-sized material. Overhead air piping was simplified, many a T cut out of the system, the ½-in. drops run from a single overhead feeder. With line-stocked rivets, a waist-high shelf for rivet guns and drills, one jig serving where two had previously been needed, pod's riveting time was cut from four hours to two.

Elimination of dollies was a large factor in the speed-up of production.

With dollies out of the way, maintainers had fewer wheels and frame-members to lube, fewer machines to repair and schedule for overhaul (especially welding and repainting).

The stockroom was eliminated. In its place went a tail-assembly area, including two big Zenith jigs. Into effect went a "minimum bundle" system—an established "package" of parts calculated as so many production-days' supply. When an assembler opened a bundle, he found a "red" shortage tag—which meant "reorder." He passed the tag along to the production control man. By the "minimum bundle" system, each assembler became, in effect, a part of production control.

For maintenance, "minimum bundles" meant less clean-up because parts were packaged, not binned. Now, too, they could sweep down rows of machines, rather than around them—a time-consuming chore.

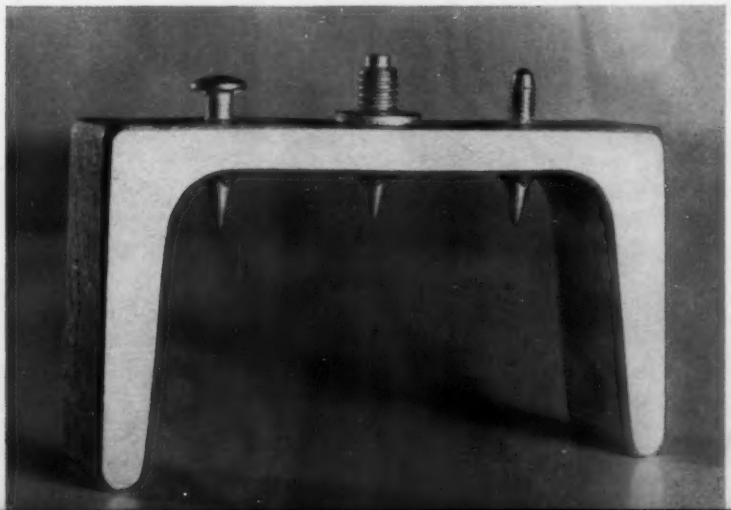
For all three segments of Longren's team, the move meant savings: industrial engineer Cole was able to reduce costs some 60 per cent (by eliminating costly overtime); plant engineer Pasnow saw the move completed in but two days and at a cost of less than $3000; maintenance foreman Podgurski sliced 24 man-hours off his weekly routine maintenance schedule.

This is the new departmental lineup arrived at in the conference reported here. Note the line stock cabinets beside each jig, the additional aisles and the uncluttered working space, all of them bonuses derived from the cooperating team

Loading the new hand-operated stud driver is a comparatively simple and safe operation. Jaw-changing is simple, too

Stud Driving With a New Hand Tool

Two photos immediately above show method of placing and driving the studs. Photo below demonstrates how different studs can be driven through steel



ONE MORE HANDY little tool has been added to the plant engineering department's bag of tricks. It is a fairly simple, well-engineered stud driver. And the only power needed is that provided by a few strokes from a 2 or 3 lb hammer. This stud driver was one of the many new products displayed recently at the 7th Plant Maintenance and Engineering Show.

Hilti Rapid Fastening Systems, Inc., manufacturers of the device, say that one of the secrets of the unit's operation is the design, shape and material of the studs used. Its so-called ballistic point assures easy penetration, it is said, and its conical shaft is described as giving extremely high pull-out resistance.

Available in five different types for use with various types of studs, the unit may be obtained in complete kits ranging in price from $33.75 for the DM6 De Luxe unit with tool chest, 3 rams, 3 rings to control penetration, 2 sets of jaws, a 2½ lb hammer and a key for ¼ in. hex nuts, to $17.65 for the kit for narrow channel work.

A cost comparison study was recently made, according to the manufacturers, and it disclosed that the subject job, fastening clamps on a concrete column in a machine shop, was performed at a cost of $1.56. This consisted of driving 100 studs during a ½ hr period at $3.125 per hour.

Want More Information?

Illustrated folders, complete price lists, and information on the tool's operation may be had upon request. Just drop a line to The Editor, Plant Engineering, 110 South Dearborn St., Chicago 3.

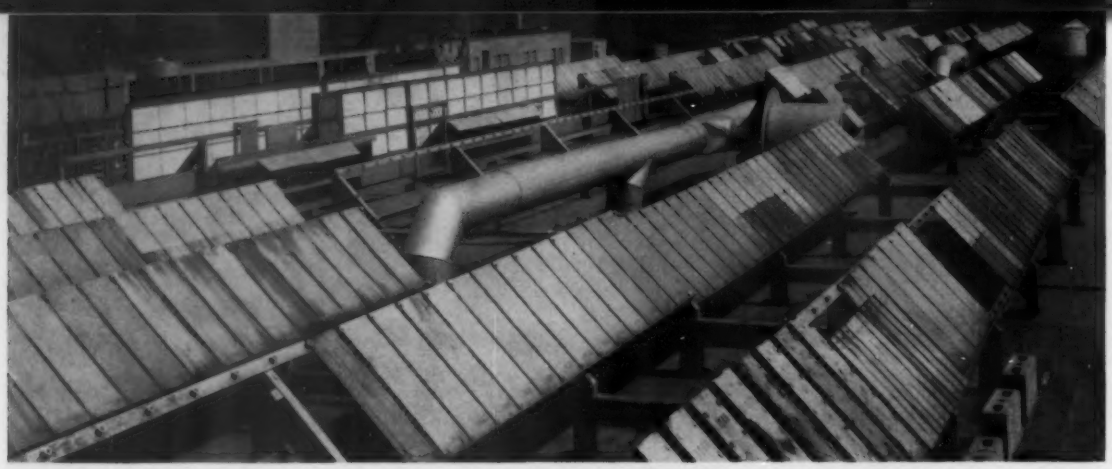


Fig. 1. Atmospheric exposure testing stations at the Aluminum Research Laboratories in New Kensington, Pennsylvania

Before Treating Steel Surfaces:
Check These Test Results for Preparations to Fit Your Problem

By CHARLES H. LAING, Aluminum Research Laboratories, Aluminum Company of America

FOR YEARS PAINT manufacturers, plant engineers and technical societies have been investigating the problems confronted in providing protective coatings for steel. The results of these tests have been invaluable in leading to better painting practices.

Much has been learned in the last 15 years, both from tests published by others, and from tests undertaken at our Aluminum Research Laboratories to find the most practical answers to surface preparation, priming and top coats. Some of the findings at Alcoa are presented as a guide to others with similar problems.

The tests started in May, 1941, at Point Judith, Rhode Island, and at the home of Alcoa's Laboratories, New Kensington, Pa. At the former location, plates were exposed for seacoast atmosphere tests; in New Kensington, industrial atmosphere exposures, and outdoor alternate immersion tests were undertaken.

Tests were conducted on I-beams and steel plates. The structural steel I-beams—5 in. web by 19 in. long—and steel plates—8 in. by 12 in. by ⅛ in.—were either rotary scratch brushed, dust blasted or flame cleaned.

"Rotary scratch brush" refers to power wire brushing to remove loose rust and scale.

"Dust blasting" refers to a fine sand blast. Immediately after dust blasting, the panels were wrapped in heavy paper and primed as soon as possible.

"Flame cleaning" was done by representatives of Linde Air Products Co. They subjected the panels to a multiple jet oxy-acetylene flame to remove all loose scale and drive out all free and combined water. The primer was applied while the surface was still warm (approximately 150 F).

Generally, all grease spots and foreign matter were removed with a solvent, then all sharp edges were rounded by filing.

The I-beams and plates were scratch-brushed and then given a proprietary chemical treatment. This consisted of a phosphoric acid and water solution applied with a swab of steel wool. Any loose powdery phosphate deposit was wiped off before priming.

After priming, paint was applied to I-beams and structural steel plates. It was composed of 2 lb 205 aluminum

Table I. I-beams—description of surface preparations employed, painting systems applied and test results are given below

Panel No.	Surface Treatment	Primer	8 Years		12½ Years	
			*rust std	*primer exp	rust std	primer exp
1142	Rotary scratch brush L ½ Synhibit treatment †	Red lead in oil (28 lb form.)	9	9	8	8
1143	Dust blasted	Red lead in oil	9	9	8—	8
1144	Flame cleaned	Red lead in oil	9+	9+	7	8
1145	Same as 1142	Alkyd red lead	9+	9	8	7+
1146	Dust blasted	Alkyd red lead	9+	9+	9+	9—
1147	Flame cleaned	Alkyd red lead	9+	9	8—	7+
1148	Same as 1142	Aluminum paint in phenolic resin varnish	9—	9+	6	6
1149	Same as 1142	Aluminum-$ZnCr0_4$(2:2) in phenolic resin varnish	9—	9+	7+	8—
1150	Same as 1142	Fe_20_3-$ZnCr0_4$ in phenolic resin varnish	10—	9—	8+	8
1151	Same as 1142	$ZnCr0_4$ in phenolic resin varnish	10—	9+	9+	9

*Rust standard and primer exposure ratings based on A.S.T.M. standards; rating of 10 is equal to perfect
†After entire panel is rotary scratch brushed, either right or left half (as indicated in tables) is given the Synhibit treatment

paste to a gallon of phenolic resin varnish. Two top coats were applied.

Methods and results of atmospheric exposure tests are charted in Tables I and II.

Significant differences first became decidedly noticeable on the painted structural steel plates (panels 1152-1160) after five years' exposure.

It will be noted that results on the I-beams (1142-1151) disagree, in some respects, with the results obtained on the steel plates. On the I-beams, Table I, the alkyd red lead primer appears to be superior to red lead in oil. Also, the zinc chromate primer on beam No. 1151 gave much better protection than the same primer used on the steel plate No. 1160. And the iron oxide-zinc chromate primer was much better on the I-beam than on the plate. These results definitely indicate that the I-beams initially had much less mill scale on their surface than the plates. The reason for this is that synthetic resin-base primers generally perform well on steel free from mill scale.

The primer on the I-beams that were subjected to seacoast atmospheres at Point Judith, R. I., was followed, on all panels, by two top coats of paint, whose composition was 2 lb, 205 aluminum paste per gal of phenolic resin varnish. Surface treatment and primer for panels at Point Judith are indicated in Table III.

After a total exposure of 7⅔ years at the Point Judith exposure station, the painted sections were rated as follows:

J105—Good condition, best of group
J108—Good condition, except for rust blistering near bottom
J106—Fairly good condition
J101—Fair condition
J104—About the same as J101

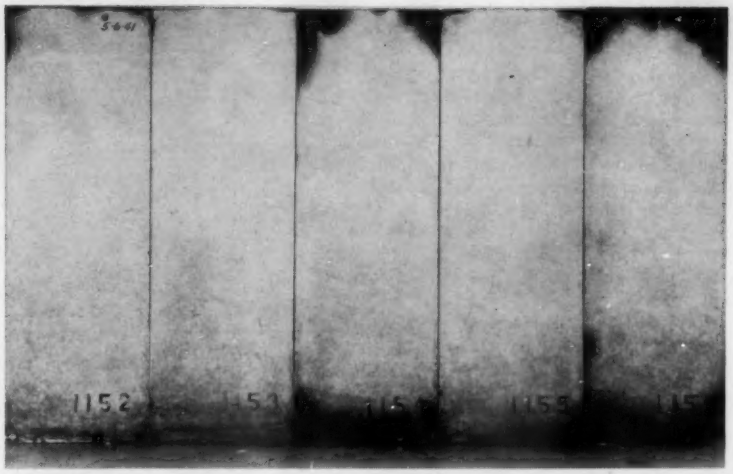


Fig. 2. Steel plates surfaces after six years of industrial atmospheric exposure

J103—Poorer than 104, fair condition
J102—Poorer than 104, fair condition
J107—Poorest in group, very poor condition

It will be noted that these results are in fair agreement with the New Kensington atmosphere tests on I-beams.

For the outdoor alternate immersion tests in salt water paint was applied after priming. It was composed of 2 lb 205 aluminum paste to a gallon of phenolic resin varnish. One coat was applied to all plates.

Treatment and primer are indicated in Table IV.

Generally, this group did not show significant failure until after 12 weeks' exposure to the outdoor alternate immersion cycle. At this stage of the test, the group was taken from the tank, cleaned, and inspected. Results of this inspection indicate that rotary wire brushing, plus a proprietary chemical treatment, or dust blasting, were about equal in effectiveness as surface preparations when followed by 33-lb red lead in oil.

When these treatments were compared under an alkyd resin-base red lead primer, dust blasting appeared to be slightly more effective than rotary wire brushing plus chemical treatment. Flame cleaning under the same primer would seem to be about as effective as dust blasting.

The 18 weeks' inspection showed that dust blasting was more effective than rotary wire brushing even when followed by a chemical treatment; flame cleaning rated second as a surface preparation. It was also noticed that at this stage of exposure, the 33-lb red lead in oil gave slightly better protection than the alkyd resin-base

Table II. Steel plates—results of atmospheric exposure tests of these plates, 8 in. by 12 in. by ⅛ in., are indicated below

Panel No.	Surface Treatment	Primer	5 Years		8 Years		12½ Years	
			*rust std	*primer exp	rust std	primer exp	rust std	primer exp
1152	Rotary scratch brush Rt ½ Synhibit treatment	Red lead in oil (28 lb form.)	9+	10	9—	9+	8—	9—
1153	Dust blasted	Red lead in oil (28 lb form.)	10—	10	9	9	8	8—
1154	Same as 1152	Alkyd red lead	8+	9+	Removed at 6th yr insp		—	—
1155	Dust blasted	Alkyd red lead	9—	10—	9—	10—	8+	9
1156	Flame cleaned	Alkyd red lead	7	9	Removed at 6th yr insp		—	—
1157	Same as 1152	Aluminum paint in phenolic resin varnish	6	9	"		—	—
1158	Same as 1152	Aluminum-$ZnCr0_4$(2:2) in phenolic resin varnish	8—	9	"		—	—
1159	Same as 1152	Fe_20_3-$ZnCr0_4$ in phenolic resin varnish	7	9	"		—	—
1160	Same as 1152	$ZnCr0_4$ in phenolic resin varnish	8	9	"		—	—

*Rust standard and primer exposure ratings based on A.S.T.M. standards; rating of 10 is equal to perfect

primer (panels C134 and C135 vs C137 and C138).

After 26 weeks' exposure, the test was discontinued. Again, based on the results of the final inspection, it appears that dust blasting is slightly more effective than rotary wire brushing (C135 vs C134 and C137 vs C136) even when brushing is followed by chemical treatment.

Flame cleaning appears to rank third as a method of surface preparation (C138 cf C137, C136). The other primers in this test (used on Panel Nos. C139 to C142) compared favorably with red lead in oil. Apparently, under conditions where structural steel is subjected to immersion in salt water, these phenolic resin-base primers perform much better than under atmospheric exposure.

The results of these tests indicate that dust blasting (1153 and 1155 shown in Table II) is generally the most effective method of surface treatment of the various treatments tested for structural steel. This has been particularly shown by the results of the tests in a mild industrial atmosphere.

It would appear that under severe conditions of exposure, such as seacoast atmosphere, or alternate immersion in salt water, the primer employing zinc chromate as the sole inhibitive pigment (J108 in Table III, and C142 in Table IV) is one of the most effective rust inhibitive primers. Almost as effective under these conditions were alkyd base red lead and red lead in oil.

Under mild industrial atmospheric conditions, red lead in oil (1152 and 1153 in Table II) proved to be the best primer on steel coated with mill scale, as shown by the steel plates. However, when these plates were sand-blasted, the red lead in oil primer and the alkyd red lead primer appeared to give equal results. On the I-beams, however, which apparently contained little mill scale, phenolic resin-base zinc chromate and alkyd based red lead were superior to red lead in oil. Table I.

Three coats of aluminum paint made with a phenolic resin vehicle (without primer) appeared to give satisfactory protection to the rotary scratch brushed and chemically treated structural steel I-beams for periods up to about eight years' exposure to mild industrial atmosphere. However, after 12½ years, the protection on No. 1148 was poor.

The phenolic resin-base primers were more effective in salt water alternate immersion. Even three coats of the aluminum paint (C139 in Table IV) gave fairly good results in this test. Phenolic resin-base coatings usually perform well when exposed to salt water.

Table III. I-beams—surface preparation and primer used for seacoast testing

Panel No.	Surface Treatment	Primer
J101	Rotary scratch brush L½ Synhibit treatment	Red lead in oil (28 lb form.)
J102	Dust blasted	Red lead in oil (28 lb form.)
J103	Flame cleaned	Red lead in oil (28 lb form.)
J104	Rotary scratch brush Synhibit treatment	Alkyd red lead
J105	Dust blasted	Alkyd red lead
J106	Flame cleaned	Alkyd red lead
J107	Rotary scratch brush Synhibit treatment	Aluminum-$ZnCrO_4$(2:2) in phenolic resin varnish
J108	Same as J107	$ZnCrO_4$ in phenolic resin varnish

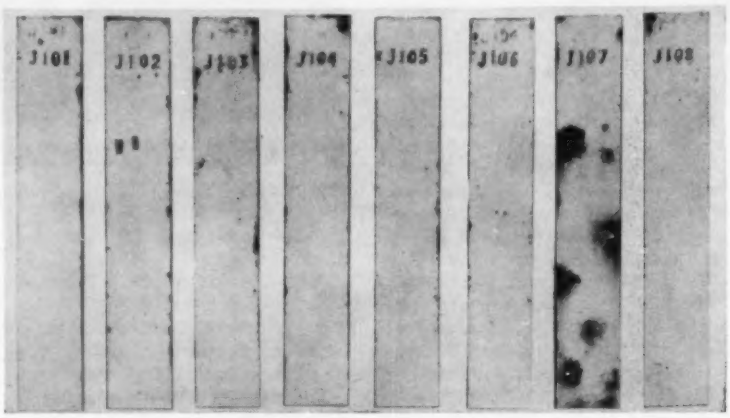


Fig. 3. Surfaces of structural steel I-beams after 7⅔ years of seacoast exposure

Table IV. Steel plates—surface preparation for immersion tests in salt water

Panel No.	Surface Treatment	Primer
C134	Rotary scratch brush L½ Synhibit treatment	Red lead (33 lb form.)
C135	Dust blasted	Red lead (33 lb form.)
C136	Same as C134	Alkyd red lead
C137	Dust blasted	Alkyd red lead
C138	Flame cleaned	Alkyd red lead
C139	Same as C134	Aluminum 205 in phenolic resin varnish
C140	Same as C134	Aluminum-$ZnCrO_4$ in phenolic resin varnish
C141	Same as C134	Fe_2O_3-$ZnCrO_4$ in phenolic resin varnish
C142	Same as C134	$ZnCrO_4$ in phenolic resin varnish

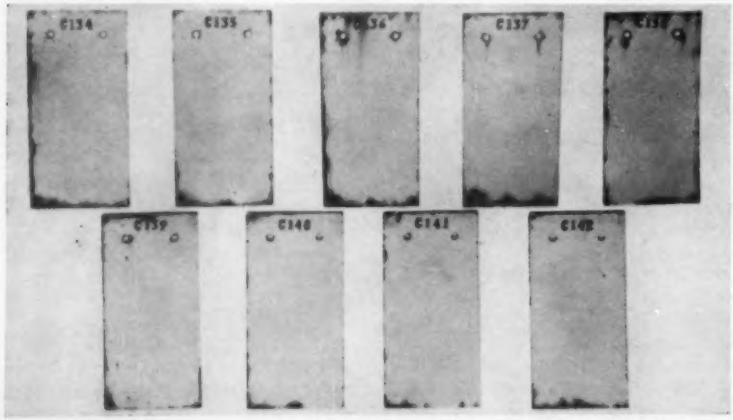


Fig. 4. Steel plate surfaces after 26 weeks of outdoor immersion in salt water

Fig. 1. Industrial building employs glued laminated wood arches. Versatility of design with this construction is great

Why and Where—as an Engineering Material—

Wood Is Versatile, Strong, Economical

By F. J. CHAMPION, Forest Products Laboratory, Forest Service, U. S. Dept. of Agriculture

WOOD HAS probably been subjected more to traditional procedures than to the engineering approach, but its real merits, its satisfying and economical use are realized when its properties are recognized, and the material properly engineered.

The properties of wood as an engineering material derive from its growth. Like all living things, water is involved in its life processes and wood always maintains an affinity for water. Its growth comes about by the laying on of successive layers of new wood cells under the bark of the tree, a relatively porous and light-colored band put on in the spring merging gradually into a denser, darker, stronger band during the summer and autumn.

Mechanical Properties

The mechanical properties of wood must be considered in the light of its nonisotropic nature. Properties vary with respect to three axes of symmetry: (1) along the pith or central core of the trunk of the tree (longitudinal), (2) in a pith-to-bark direction (radial), and (3) in a direction parallel to or (for practical purposes) tangent to the curve of the annual rings (tangential) seen on the end of a board.

A great deal of useful information about wood, (see Table I), can be condensed into a number of capsule characterizations: the density of basic wood substance is about 1.5, variations from species to species being due to relative proportions of voids to fiber walls and other anatomical structures as seen under the microscope; the specific gravity of any wood is a general index of strength; under normal conditions the properties of wood vary to some extent with its content of water; when the moisture content of green wood falls to about 30 per cent (the so-called fiber-saturation point) shrinkage begins and proceeds in a straight line manner so long as moisture is eliminated; at 20 per cent moisture content and above (and under a wide range of temperatures) wood is liable to attack by fungi that cause decay, stains, and molds—below 20 per cent the growth of such organisms is arrested.

Moisture content of wood tends to reach a state (equilibrium moisture content) in balance with existing temperature and humidity conditions in the surrounding air (at 70 F and relative humidity 40 per cent, for instance, wood tends to stabilize at about 7.5 per cent moisture); lengthwise shrinking and swelling in wood is negligible; shrinking and swelling is greatest in the tangential direction, less in the radial direction; thermal expansion of wood is negligible; thermal insulating values for wood are good; below the fiber-saturation point most strength values for wood increase as drying progresses; the strength values of air seasoned wood and kiln dried wood are the same, other factors being equal, if the drying has been properly conducted.

Putting Information To Work

There are many applications of the foregoing information. Lumber properly seasoned by the manufacturer for use remains at a proper moisture content only so long as it is given decent care. Flooring, sash, window frames, interior trim—all expensive items—are frequently delivered on a construction job, stacked on the ground more or less haphazardly, and left to the mercy of heavy and prolonged wetting by rain

or snow and to decay hazards involved in contact with the ground while brick and tile are protected by tarps. The result on installation of the wood is undue shrinkage in place as the wood dries out, opening unsightly cracks and perhaps loosening joints and decreasing the holding power of nails. Wood flooring is especially entitled to care on the job.

Tests and Grades

Certain industrial operations, such as laundering, pickling, refrigerating, water quenching, etc., produce conditions of extreme high humidity (producing the corresponding high equilibrium moisture content in wood) that will inevitably damage wood ceilings and woodwork. In such cases preservative treatment of woodwork with nonleaching preservative chemicals should be considered.

The strength values on which structural timber design are based derive from two sources: from tests on small clear specimens of the various species to determine the essential strength properties inherent in the species and from tests of full-scale timbers and typical wood structures to evaluate the effect of knots and other growth variations.

More than 175 species have been tested at the Forest Products Laboratory. (See Table I.) Structural timber stress grades as set up by the various regional timber producers' associations provide grades related to basic stress values assigned to timbers of clear material in the various structural sizes. Strength reductions to compensate for defects are implicit in the grade. The actual grading is a function of industry grading bureaus, which sort and certify the timbers at the manufacturer's plant.

Structural Design

Recent years have seen notable improvements in timber design. One of these improvements is the introduction of timber connectors, basic engineering having been worked out at the Madison Laboratory. The timber connector is a plate or ring inserted between timbers joined by bolts for the purpose of distributing the load passed from one timber to another over a maximum area of wood. Without connectors an area approximately equal to the cross section of the bolt was available to resist shearing forces. The increased bearing afforded by the connectors has resulted in an increase of four or five fold in the strength of joints and a corresponding increase in safe loads for timber structures, such as building frames, bridges, and towers.

More notable in the field of modernization of timber construction is the

Table I. Comparison of seven properties of some commercial species of wood

Key to classification of woods: Columns 2 and 4 represent a gradation of properties in the woods from those which can be dried and worked with comparative ease (class 1) to those which present some difficulty (class 4). Column 3 represents a gradation from those woods which possess the greatest ability to stay in place in use (class 1) to those species which do not possess that ability to the same extent (classes 2, 3, 4, in the order named). Column 5 represents a gradation from those possessing greatest nail-holding power but have greatest tendency to split (which necessitates the use of smaller nails) to those having the least nail-holding ability but which are less likely to split. In column 6, woods in class 1 are known to be used commercially in glued construction. Class 2 includes species which are not believed to be difficult to glue. Class 3 includes species which are known to require more attention in gluing. Class 4 includes woods which are known to present difficulties in gluing, and class 5 those species which it is believed would present some difficulties. Column 7 presents comparative values for resistance to decay of heartwood when used under conditions that favor decay, class 1 being most decay-resistant. Column 8 represents a classification of softwood species with respect to ability to hold paint when used outside, class 1 species holding paint the most satisfactorily. Hardwood species are not commonly used for exterior work requiring painting and have not yet been classified.

Species	Ease of kiln drying[1]	Ability to stay in place	Workability	Nail-holding ability	Ease of gluing	Resistance to decay	Ability to hold paint
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Hardwoods							
Ash:							
Black	3	4	3	....	....	....	....
White	2	3	4	2	3	4	....
Birch:							
Paper	2	4	3	....	5	....	....
Sweet and yellow	2	4	4	1	3	4	....
Cherry:							
Black	4	3	3	....	....	....	....
Pin	3	3	2	....	2	....	....
Chestnut	2	2	2	4	1	1	....
Elm:							
American	3	5	4	3	1	....	....
Rock	3	5	4	....	....	....	....
Gum:							
Black	3	5	4	....	2	5	....
Red	[2] 2, 4	4	4	3	1	3	....
Maple:							
Bigleaf	3	3	3	....	5	....	....
Red	3	3	4	....	5	....	....
Sugar	3	4	4	1	3	4	....
Oak:							
California black	4	3	4	....	5	....	....
Red	[3] 4, 5	4	4	1	3	4	....
White	[3] 4, 5	4	4	1	1	2	....
Sycamore	4	4	4	2	2	....	....
Walnut, black	4	2	3	....	1	1	....
Softwoods							
Cedar:							
Alaska	1	1	3	....	2	1	1
Northern white	2	1	2	5	2	1	1
Port Orford	2	2	3	....	2	1	1
Western red	[4] 2, 3	1	2	5	2	1	1
Cypress, southern	3	2	3	3	2	1	1
Douglas fir	1	3	4	3	1	[5] 2, 3	4
Fir:							
Alpine and balsam	1	....	2	5	2	5	3
Grand, noble and white	1	3	2	5	2	5	3
Pine:							
Jack	1	3	3	4	2	....	3
Lodgepole	1	2	2	5	2	....	3
Northern white	2	1	1	4	1	....	2
Norway	1	3	2	3	2	....	3
Pitch	1	3	4	3	2	3	4
Ponderosa	1	2	2	4	1	....	3
Southern yellow	1	3	4	2	1	[5] 2, 3	4
Sugar	2	1	1	....	1	....	2
Western white	3	2	2	4	1	....	2
Redwood	[6] 3, 4	2	3	4	1	1	1
Spruce:							
Engelmann	2	2	2	5	2	4	3
Red and white	1	2	2	4	1	4	3
Sitka	1	2	2	4	1	4	3

[1] Softwoods are in general easier to dry than hardwoods. A softwood given the same numerical rating as a hardwood is, therefore, regarded as slightly easier to dry. These ratings are based on ease of removal of moisture without visible degrade but do not take into account susceptibility to reduction in strength in drying under high temperatures.

[2] 2 refers to sapwood and 4 to heartwood, known commercially as sap gum and red gum, respectively.

[3] 4 refers to the upland type of oak and 5 to the lowland type of oak.

[4] 2 refers to material from upper logs and 3 to material from butt logs which are generally susceptible to collapse.

[5] 2 refers to dense Douglas fir and dense southern yellow pine.

[6] 3 refers to material from upper logs and 4 to sinker stock from butt logs.

Fig. 2. Veneer slicer at the Forest Products Laboratory. Slicing technique is being investigated in course of developing new outlets for neglected hardwoods

development of glued laminated structural timbers[1] (see Fig. 1). In the fabrication of glued laminated members, board-sized units are bent over forms and bonded with modern high durability wood adhesives to form beams and arches. The basic strips are much more effectively and readily seasoned than large timbers and the versatility of design afforded by the glued-up construction is almost unlimited.

Wide Range of Applications

Glued laminated wood arches range in type and purpose from simple curved light members that serve as barn and livestock housing rafters to giant arches with spans of 200 ft or more used to support industrial, hangar, or gymnasium roofs without obstructing supports. Many interesting arches have been designed with three or more hinges and cross-sectional areas varied throughout the length to accommodate areas of varying stress.

The glued laminated arches do not require special fireproofing treatment and in a fire they tend to protect themselves with their own char and not become subject to sudden failure as are steel members.

Plywood is far from new in the construction field, but it really came into its own with the comparatively recent development of durable glues that enabled plywood manufacturers to market an exterior grade of plywood that will withstand severe humidity conditions outdoors or within structures.

Plywood consists of thin sheets or plies, of wood placed with the grain of adjacent plies at right angles. Hence, in building up plywood a step is made toward obtaining equality of properties in the two directions, parallel and perpendicular to the edge of a board. The greater the number of plies used for a given panel thickness, the more evenly the material is distributed, and the more nearly equal is the strength of the panel in the two directions. For the same reason the shrinkage and swelling of plywood in length or width with moisture content changes are very much less than those of solid wood across the grain.

Because it is more resistant to splitting than ordinary wood, plywood panels may often be used in thinner dimensions than lumber, and may be readily nailed or fastened with screws near the edges without any injury to the panel.

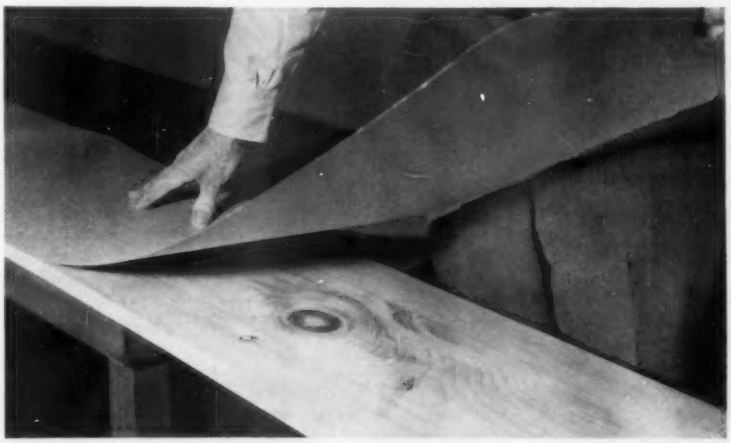
Plywood is made both from hardwoods and softwoods in a variety of thicknesses and various types and grades. The term type is usually applied to a classification that indicates whether or not the glue line is resistant to moisture. The grades indicate the quality of the face veneers that surface the plywood. (See Fig. 2.)

The developing shortage of high-grade face veneers for surfacing structural plywood has led the industry to develop various mechanical patching methods for eliminating defects and to the use of masking overlays. The necessity for using overlays of durable, smooth, paintable surfaces of resin-treated paper tends to give a plywood of great versatility and superior service characteristics. (See Fig. 3.)

In addition to the designing and engineering of wood, processing has reached a high state of technological development. The proper seasoning of wood in modern lumber dry kilns and according to scientific drying schedules is accomplished in less time than formerly and with less degrade of lumber. Control of moisture content throughout machining, gluing, and assembling operations, a major factor in trouble-free manufacture, is a standardized process in the modern woodworking plant.

In the fabrication of panel materials balanced construction of laminations to avoid warping has eliminated this troublesome feature. High-carbon steel woodworking cutters have reduced machining troubles and down time for tool sharpening. Dimensional control by proper design is well understood. Statistical quality control has, in many plants, provided control of ever important moisture content and a constant indicator of incipient variations or departure from standards.

Fig. 3. Combination of low-grade lumber and resin-treated paper promises to provide a new product with little shrinkage and superior surface for finishing



[1] Information suggested in reference to glued laminated timber construction is given in detail in USDA Technical Bulletin No. 1069, "Fabrication and Design of Glued Laminated Wood Structural Members," available from Supt. of Documents, Washington 25, D.C., price 60 cents.

Drilling on pivot point is one important lesson taught driver trainees to familiarize them with limitations of vehicle

Kodak Trains Drivers, Cuts Accidents

Even Fire Department Trained to Move Valuables in Emergency

ONE OF THE finest training programs for employees who work with powered fork-trucks has been developed by the Eastman Kodak Company, Rochester, N. Y.

E. D. Happ, Safety Department and A. C. More, Training Department, felt that with the large use of lift-trucks in their organization there was a definite need for a program that would train new operators, as well as giving more detailed instruction to drivers with previous experience.

Both men agreed that in order that the program would obtain the desired results, supervisors of fork-truck operations should also receive instruction and training, comparable to that given to the experienced driver.

A fork-truck training program was drafted by Happ and More and others working with them. Specific needs to make the program a success were submitted to management for consideration. Recommendations included the need for centralization of training, provision of a practice driving area, the number of hours needed to process a group of trainees. The estimated cost for the whole program also was included in recommendations submitted. With management's approval, the rough material was presented to departmental representatives for their comments and suggestions.

The committee then refined the proposed training course material and three new members were added to the Safety Department staff for the purpose of instruction both in the classroom and on the driving range. The safety department obtained three fork-trucks. Three thousand square feet of floor space was allotted the program for driving range practice.

The final program consists of a 16-hr course for experienced operators and a 32-hr course for inexperienced operators. These include discussion type lectures, visual aids, printed materials for each session and frequent quizzes, all of which aid in maintaining interest. Classes are limited to six trainees.

Following is a resume of the material covered in each of the ten sessions for new operators. Most of this material is condensed to five sessions for experienced operators who, being familiar with truck operation and terminology, can absorb the material at a faster pace.

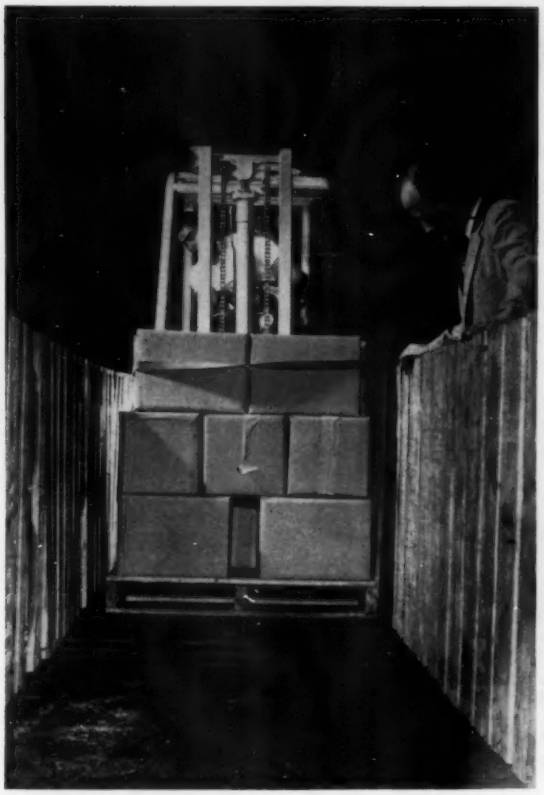
Session 1—This first class introduces trainees to the purpose of the training, to simple operating procedures, and daily checks which they must make. It also gives them time for simple maneuvering with the truck on the driving range.

Session 2—Features a quiz on Session 1 and considerable practice on obstacle course No. 1.

Session 3—Places emphasis on pertinent facts about powered industrial trucks such as load limits, striking force, comparative cost of fork-trucks, batteries and types of trucks used in the Kodak Park plants, along with their limitations and adaptions.

Session 4—Takes up the various problems involved in handling palletized material.

Session 5—Specifically presents the safe and efficient practices to be fol-



Here, a "narrow aisle" is used to teach accuracy and precision

This area simulates a freight car to teach loading, unloading

This demonstration-lesson shows dangers of overloading truck

lowed in truck and trailer loading and unloading operations.

Session 6—In like manner, the time of trainees is confined to that of handling material in connection with freight car operations.

Session 7—Introduces single pallet storing. Explains where not to place materials and how to place them in proper storage areas.

Session 8—This session is a crucial one for many operators since it introduces the methods and problems involved in tiering and stacking of palletized material. Special aptitude is required to master the techniques of upper level work.

Session 9—At this time the trainee is given his final examination on the driving range. During his time in the classroom a number of items are discussed such as elevator operations, pallet patterns and crossing of railroads.

Session 10—This session is devoted to instruction and discussion of the operator's responsibility in preventive maintenance.

Discussion of the results of quizzes is encouraged. Trainees are clearly informed that the purpose of the quiz is to assure the instructor that he has succeeded in putting across the material in an understandable manner. Trainees are graded only on the results of their driving range performance.

Problem driving sessions pertaining to situations which arise under actual driving conditions are set up, and the driver is required to solve these problems. Obstacle course driving sessions help develop skill and confidence, to break bad habits of old drivers and to assure that both new and old operators form good driving habits.

New drivers, of course, spend a much greater percentage of time on the range than do seasoned drivers. Two instructors are present at all times on the driving range for verbal coaching and individual instruction at the very moment that an improper procedure is evident.

One of the prerequisites to entering the course is that the operator be physically right for the job. Items considered in this medical check include field of vision, reaction, timing, distance judgment, and possibility of other physical handicaps which might detract from the operator's ability to safely handle the truck under stress or strain.

The results of this carefully conducted safety training program at Eastman Kodak Company are:

1. Approximately eighty supervisors are better acquainted with safe fork-truck operations.
2. Twenty-four of their fire department staff are trained to enable them to move valuable material in the event of an emergency.
3. Approximately eighty new drivers have completed the training and are operating throughout the plant.
4. Retraining of over 400 experienced drivers is nearing completion.
5. All drivers are to be licensed so that only authorized and trained persons can operate trucks. This license is issued only after proof of ability on the job and by request of his foreman.
6. Their fork-truck accident frequency has steadily decreased since the days prior to their first training session. The gospel of safe driving is spreading beyond the confines of the classroom.

Thermocouples—

These Industrial Watchdogs Need Testing and Protecting

By R. I. BETZENHOWSER, Electrical Engineer

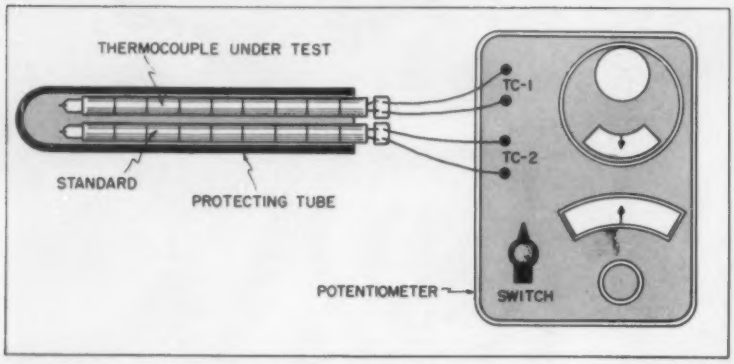


Fig. 1. When testing a thermocouple against a standard the preferred method is to place both thermocouples in the same tube thus insuring identical temperatures

THE THERMOCOUPLE is the heart and controlling medium of many industries and utilities; the thermocouple pyrometer is the demarcation line which in many instances is the measure of either successful or scrapped processes—correct or incorrect information pertaining to combustion, heating, and temperature control.

When received from the manufacturer the thermocouple will generally be found to match the output listed in the temperature emf tables supplied by the maker. But during its period of service, characteristics undergo a change. Protecting tubes retard deterioration, but cannot prevent it entirely, and when one requires replacement, the new device should be of the same materials as that specified for the instrument already in use.

Before replacing thermocouples haphazardly, however, a program of checking the accuracy of suspected units should be developed. Most thermocouples can be used long after normal drop in emf occurs merely by recalibrating the instrument it is associated with. The extent of error depends on the type of thermocouple, temperature at which it is used, atmosphere to which it is exposed, and length of time it has been in service (actually installed). It is seldom possible to determine the true extent of deterioration except by actual check, as factors affecting accuracy vary with installation.

One of the most satisfactory methods of performing periodic checks is by means of a portable potentiometer which employs a sensitive galvanometer and a bridge circuit (Wheatstone or similar) for electrical balance. These instruments are light and entirely self-contained. They are inexpensive considering an accuracy of 0.2 of one per cent.

Measurements are made by balancing an unkown emf (that of the thermocouple under test), against a known —or standard—voltage. There are no hair-springs to weaken or vary with temperature, nor damping fields to brake and create error in the movement. By use of the instruments it is possible to check not only the thermocouples, but also the accuracy of the instruments into which the thermocouple output is introduced for amplification or direct registration.

To test a thermocouple, a reference standard which is known to be accurate must be used. It is common practice to employ a second thermocouple of the same type, size, and characteristics as that under test. A new one, whose calibration has been determined by comparison with a primary standard or directly against platinum, may be used as a standard. It should be labeled and reserved for this purpose. Since its original characteristics will change gradually with time, the standard should be tested at intervals and the label corrected accordingly; it must be replaced (as a standard) when it has lost the desired limits of accuracy.

There are several methods of testing used thermocouples, and the selection of the method will depend on manner of installation. Success of the tests depends on the stability of the temperature during the test period. The methods are suggested in the order of preference:

1—Insert a reference standard in the same protecting tube as the thermocouple under test (if the size of the tube permits). Connect the thermocouples to the pairs of binding posts on the potentiometer as shown in Fig. 1, and compare the readings by switching each in turn into the bridge circuit and bringing the circuit into balance.

2—Install a reference standard ad-

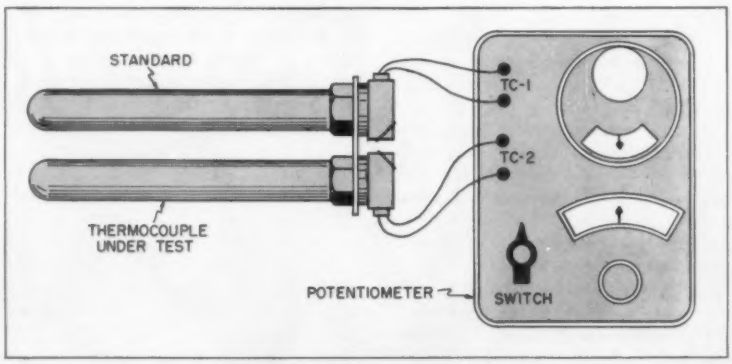


Fig. 2. When, in testing, it is necessary to use separate protecting tubes, they should be as close as possible to avoid temperature and voltage gradients

jacent to the fixed thermocouple. Drill a hole as close as possible to the fixed installation, Fig. 2, and insert the standard in such manner that the ends of both tubes are as close together as possible. To insure a fair comparison, both thermocouples should be of the same size, and the protecting tubes of the same material and size. Connect to the instrument and read as in Method 1.

3—Test the used thermocouple first, then replace it with the reference standard and read the temperature. The standard should always be inserted to the same depth in the protecting tube as the used thermocouple, and sufficient time allowed to elapse for the standard to come to equilibrium before reading.

To test an instrument, connect the same thermocouple to the potentiometer and the instrument under test through a double-pole double-throw switch, as shown in Fig. 3. Take a reading with one instrument, then switch to the other and extract a second reading. Both readings should normally be equal.

If all of the instruments in the plant utilize one type of thermocouple, the potentiometer can be calibrated for application to this type. In this event, the graduated scale may be marked directly in degrees of temperature Fahrenheit or Centigrade and the type of thermocouple marked *on the dial*. The instruments may be automatically compensated for changes in reference junction temperature by the manufacturer and no further corrections need be made.

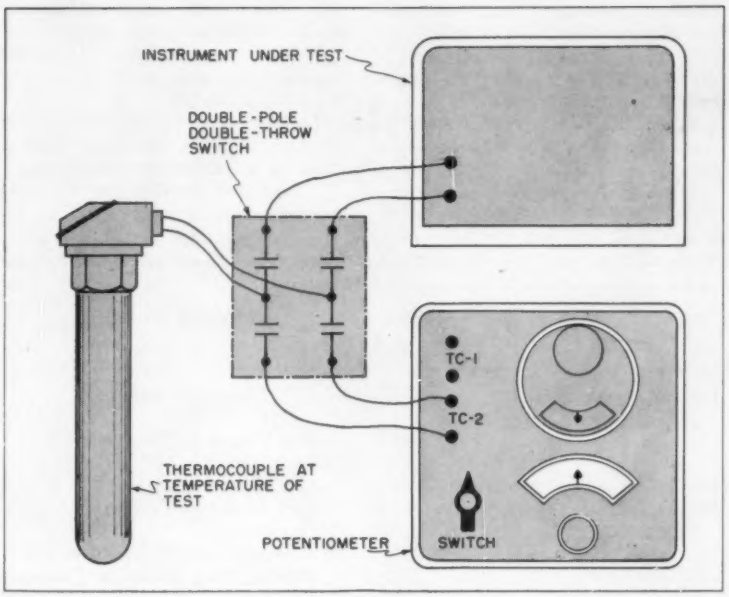


Fig. 3. Instruments normally used with thermocouples may be checked by comparing their readings with those obtained from the same source with a potentiometer. The double-pole, double-throw switch shown in sketch allows rapid transfer

If, however, thermocouples of different types and output values are used, an instrument calibrated in millivolts (or microvolts) should be employed. In this case, after the emf has been determined it will be necessary to refer to the table of Temperature EMF Equivalents, furnished by the manufacturer of the thermocouple, to determine the relative temperature.

Potentiometers calibrated in millivolts are not ordinarily supplied with

Table I. Data guide for selection of thermocouples according to temperature limits and atmospheric conditions

Type	Kind of Wire	Recommended Temperature Limits	Wire Size	Atmospheric Conditions for which thermocouple is best suited[1]
Copper-Constantan	Copper Positive Constantan Neg.	Minus 300 F to Plus 600 F	No. 20	Generally of no great consequence in this temperature range
Chromel-Constantan	Chromel Positive Constantan Neg.	0 to 1000 F	No. 14	Oxidizing or Neutral
Iron-Constantan	Iron Positive Constantan Neg.	0 to 1600 F	No. 8	Reducing or Neutral
Chromel-Alumel	Chromel Positive Alumel Negative	600 to 2000 F Continuous; Up to 2300 F Intermittent	No. 8	Oxidizing or Neutral
Platinum-Rhodium[2]	10% Rhodium, 90% Platinum (Pos.) Pure Platinum-Neg.	1300 to 2700 F Continuous; Up to 2850 F Intermittent	No. 24	Requires protection from all atmospheres with ceramic tube
Platinum-Rhodium	13% Rhodium, 87% Platinum (Pos.) Pure Platinum-Neg.	1300 to 2700 F Continuous; Up to 2850 F Intermittent	No. 24	Requires protection from all atmospheres with ceramic tube

[1]Bare thermocouples used in atmospheres or media causing chemical reaction will deteriorate the thermocouple and destroy its standard emf temperature characteristics. See Table 4.

[2]Use for replacement purposes only.

automatic reference junction temperature compensation, and it will therefore be necessary to correct it. The two most widely used methods are as follows:

First: Freezing point method of correction for cold junction temperature.

1. Insert two glass test tubes in a vessel filled with crushed ice, water.

2. Place a small amount of mercury in each test tube.

3. Place one lead-wire from the thermocouple into each of the test tubes.

4. Insert copper conductors into the mercury of each tube and connect these to potentiometer binding posts.

5. The emf between the wires in the test tubes is now equal to the difference in the thermocouple emf at the temperature of the measuring junction and at the freezing point of water.

6. As the freezing point of water is almost universally used as the reference point in the manufacturer's temperature-emf equivalent tables, the temperature corresponding to the millivolt (or microvolt) reading of the instrument can be read directly from these tables.

Second: Approximate method of correcting for cold junction temperature.

1. Note instrument temperature by means of mercury thermometer.

2. From the thermocouple's tables issued by the manufacturer, determine the emf corresponding to that emf.

3. Add this emf to the dial reading of the potentiometer after bridge balance is obtained.

4. Determine from the tables the correct temperature, corresponding to the sum of the emf's.

When replacing a thermocouple, the switched units should in every case match up in characteristics, size, etc. When in doubt, the correct thermocouple required is generally indicated by markings on the associated instrument scale.

Table II. Data guide for selection of protecting tubes depending on environment

Type of Environment	Max Temp F	Material of Tube
Natural or oxidizing (ordinary heat treatment)	2200	27% Chromium iron
	2400	Pure Nickel or Porcelain
	2900	Porcelain
Neutral or reducing, carbon Monoxide (such as gas curtain hardening)	2200	27% Chromium Iron
	2400	Pure Nickel or Porcelain
	2400	Porcelain
Hydrogen, ammonia (such as bright hardness & brazing)	1000	Wrought Iron or Seamless Steel
	2200	Inconel, Pure Nickel or Porcelain
	2700	Porcelain
Nitriding	2200	Inconel or Nichrome
Slagging or corrosive action, neutral or oxidizing, (such as forging furnace or kilns)	2700	Silicon Carbide
Slagging or corrosive action, neutral or reducing, (such as open hearth roof)	2500	Silicon carbide with inner porcelain
Sulphur content	2000	27% Chromium Iron
Sulphur dioxide	2200	Inconel
Hydrogen sulphide	1000	Inconel
Lead vapor (rare metal refining)	2200	Inconel
Steam, superheated	2000	Inconel
Carburizing	2000	27% Chromium Iron or Inconel
Cyanide or salt bath	1750	Drawn Chromium Iron (specially treated)
Salt bath	2400	Same material as Pot or Inconel
Carburizing salts	2000	Same material as Pot or Inconel
Dowtherm		Pure Nickel or Porcelain
Oil baths		Seamless Steel or Wrought Iron
Glass	2800	Porcelain
Tin		Extra-heavy Wrought Iron or Seamless Steel
Lead	1000	Extra-heavy Wrought Iron or Seamless Steel
Lead	2000	27% Chromium Iron
Zinc (galvanizing)	1000	Extra-heavy Wrought Iron (put an open-end pipe sleeve around the procting tube; this should be replaced when eaten through)
Brass	2100	27% Chromium Iron
Brass or copper alloys, (intermittent only)	2300	27% Chromium Iron
Aluminum alloys	1500	Cast Iron; paint with whiting daily
Magnesium dow metal		Extra-heavy Seamless Steel or 27% Chromium Iron
Die cast metals	1200	Cast Iron or extra-heavy wrought Iron; Paint with whiting daily
Gas generators		Inconel
Powder metallurgy		Inconel

NOTE: Measurements of higher temperatures than those listed (3000 to 10,000 deg F) is generally accomplished with optical pyrometers, having self-contained, light-sensitive thermoelectric couple.

Selection

The data in Table I presents a summary of the information to be considered when a new instrument is being chosen; in these cases, the thermocouple selection is not restricted by an instrument already on hand.

The wire sizes shown in Table I are nominal. Usually, heavier conductors are required when the temperature to be measured is relatively high. However, wires of larger cross-section reduce the sensitivity of the thermocouple; a compromise must be made. The user must choose between the qualities of greater sensitivity of the smaller wires and the greater durability of the larger wires.

In the temperature ranges for which Iron-Constantan or Chromel-Constantan are recommended, it is not necessary to use wires heavier than No. 8. All the lighter gages of Chromel-Alumel may be used up to 1600 F; from 1600 to 2000 F, No. 8 wire is recommended; above 2000 F, No. 6 or heavier conductors should be used.

The transfer of heat from the hot medium to the thermocouple measuring junction should be as rapid as possible.

The actual rate of heat conductivity to the measuring junction is controlled by the kind of transfer medium (liquid or gas) used and the characteristics of the thermocouple protecting tube (sleeve).

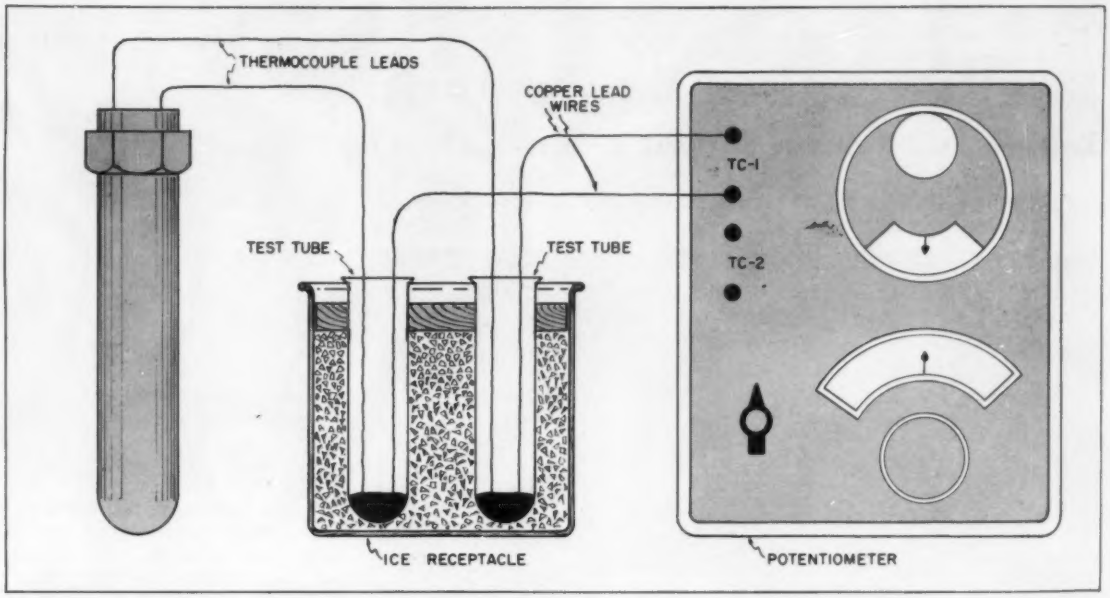


Fig. 4. Two methods of correcting for cold junction temperature: Freezing Point and Approximate Method (see text)

Heat will be conducted along the thermocouple wires and the sleeve to the point of lowest ambient temperature. This rate of heat conductivity varies with the thickness (mass) and material forming the sleeve and on the size and composition of the thermocouple leads. Thermocouples made of thinner gage wire will usually give more rapid response to temperature changes, but may have an appreciably shorter life span.

Position Important

When thermocouples are used with automatic control instrumentation, it is necessary to have the thermocouples in such a position that they invariably respond to a definite relationship within the process being controlled. This relationship should be constant.

If the thermocouple is in an atmosphere furnace, an immersion depth of 30 in. may be insufficient to obtain a true reading; on the other hand, an immersion depth of 5 in. may be adequate for a liquid salt bath. To test the depth, a bare thermocouple may be used to explore the inside of the protecting tube. If by withdrawing the thermocouple one inch from space being registered, the temperature indication shows no apparent change, it can be assumed that the distance of immersion is sufficient for a true temperature indication.

Thermocouples must be protected to insure long life and maintain their inherent accuracy. Table II shows recommended tubes for various environments.

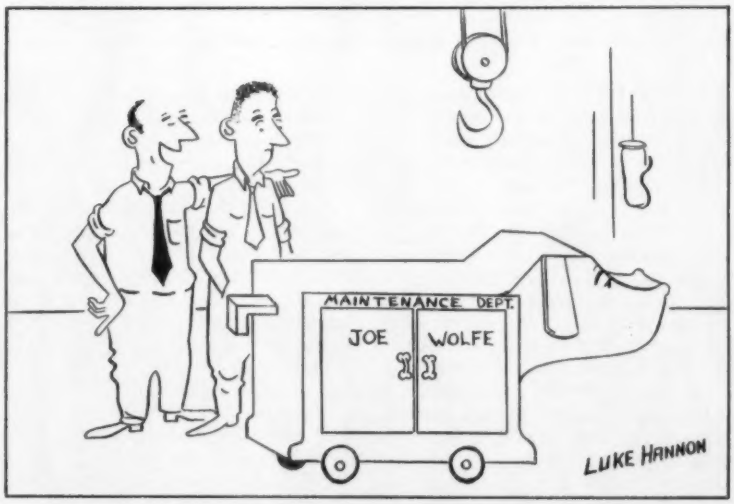
A thermocouple should have as little protection as possible consistent with favorable life characteristics. The protecting tubes reduce sensitivity.

The temperatures recommended in Table II are the maximums for continuous duty; for intermittent duty, higher temperatures may be tolerated. Heavier tubes are generally used for excessively corrosive or abrasive environments. Incoloy can be substituted for Inconel.

Failures in a system may be the fault of the measuring instrument or the thermocouple itself. Among the faults that may exist in the thermocouple are a poor connection of the lead wires (they must be metallically bonded by weld) or by poor junction bonding of the couple itself, causing excessive contact resistance. Gas or corrosive vapors may have seeped in around the thermocouple and affected it; full or partial shorting of the leads may have developed along the device or its extension wires at some point between it and the instrument.

A quick check of the thermocouple can be made by moving it around slightly and observing if the instrument reading varies or remains stable. If the reading is erratic, the thermocouple should be replaced and the old one cleaned and tested.

To check the emf or voltage output of a thermocouple, use the potentiometer as illustrated in Figs. 1, 2, and 3.



"Joe not only likes dogs. He really loves 'em."

Shell Molding Equipment

Design and System Layout Accomplished by "Home" Talent

By H. WEAVER, Director of Manufacturing, Brillion Iron Works, Inc., Brillion, Wis.

Fig. 1. Molds are taken from storage carts and placed on the conveyor trays

IN THE NEVER ending search for better methods in the foundry industry, Brillion, along with many others started to experiment with shell molds in 1951. The usual home-made dump box was built and small shells were produced, which further excited our curiosity about the process.

The foundry sales force succeeded in bringing in orders for production castings designed for the shell process. This meant that we were in the shell molding business except for one thing —we had no production machinery.

Our plant engineering and production people then started a hurry-up analysis of all available machinery for the new process. This search disclosed one fact. If we wanted machinery to do the job, the way we wanted it done, we would have to design and build it ourselves. Molding, we felt, was the first problem, so design of a molding machine was started by our plant engineering department.

As fast as the molding machine design was transferred to paper, construction began in our maintenance department. Since that time, the spring of 1952, we have had two or three maintenance men permanently assigned to the shell project.

Three shell molding machines have been built complete with shell gluing facilities, as well as three six-station shell core blowers (semi-automatic in operation) and one two-station hand operated core blower. These machines naturally have reflected improvements developed from experience. The controls for all automatic cycling were constructed by the electrical maintenance department under the guidance of our electrical foreman.

Our primary concern was given to the development of quality in the castings. Later we concentrated on producing these quality castings in quantity.

Previously molds were poured by bedding down in sand retained in long steel pans. Setting up the molds and pouring necessitated a great deal of labor. The manual shake-out was not only inefficient but also hazardous, as red hot castings had to be carried by hand across the pouring floor to tote boxes at the aisle.

Trolley Conveyor

Our engineers were then asked to direct their attention to this handling problem. It was decided that a trolley conveyor would best serve our needs inasmuch as its extreme flexibility would allow us to carry the poured molds overhead and thereby conserve floor space. Sufficient space was saved to allow us to place an extra loose molding floor in this area. In loose molding operations, castings are made for our maintenance department as well as samples are cast for our customers. Single loose patterns as distinguished from production patterns are used.

The system was designed with 24-in. square pans to hold the bedding or backup sand. The 88 pans were mounted in a pendant frame carried by a trolley conveyor on 4-in. I-beam tracks, Fig. 3. The unit was designed so that if increased capacity is required, additional space will be available.

The conveyor was laid out so that a minimum amount of walking would be necessary. The assembled shell molds are placed onto a mobile storage rack at the molding operation. These mobile racks are then pushed to the storage area and when the job is scheduled for pouring, the rack is moved to the conveyor loading zone.

The molds are loaded onto the pouring conveyor as the pans move past the storage rack, Fig. 1. They are bedded down into the loose sand which is fed into the pans after the shakeout operation. Iron for the shell mold

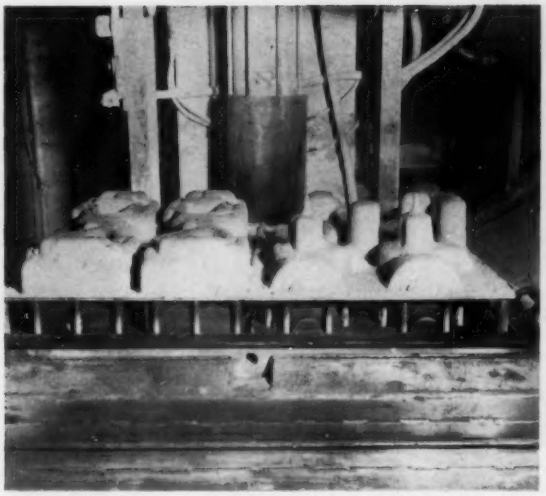


Fig. 2. Shell mold portion has been stripped from its pattern

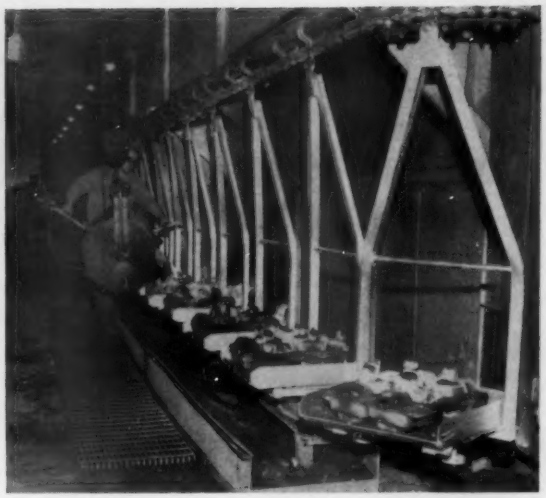


Fig. 3. Castings are poured while the conveyor is in motion

castings is brought from the cupola in 600 lb covered ladles carried by heavy duty pouring hoists. The pourers move around the loop and pour where the conveyor parallels the tramrail. One ladle is filled at the cupola while the second ladle is pouring.

The introduction of molten iron into the mold produces considerable amounts of smoke and flames which are controlled by an exhaust system at the pouring area. Immediately after pouring, the conveyor turns and enters a cooling tunnel which leads upward to the ceiling level, Fig. 4. This tunnel is also exhausted to remove all smoke from the area.

After approximately 30 minutes of cooling time, the conveyor travels to the shake-out area at floor level. An automatically operated pneumatic cylinder raises the back of each pan, Fig. 6, as it crosses the shake-out conveyor, dumping the solidified casting and excess sand onto a perforated plate at the end of an oscillating conveyor, Fig. 5. The action of the conveyor as the castings proceed along, shakes out most of the sand and removes a considerable amount of the core sand from the inside of the casting.

The shakeout employees break off excess metal, gates and sprues and roll the castings over to dump out all loose sand. Then they remove the castings and place them in tote boxes or skids for transfer to the cleaning room. Side-draft exhaust hoods are also used in this area to remove heat and dust from the operation. The waste sand and excess metal are conveyed onto a belt conveyor with a magnetic separator to remove all metal from the scrap sand.

Fig. 4. Trays on way to cooling tunnel

Fig. 5. Conveyor shakes out casting core sand by oscillation

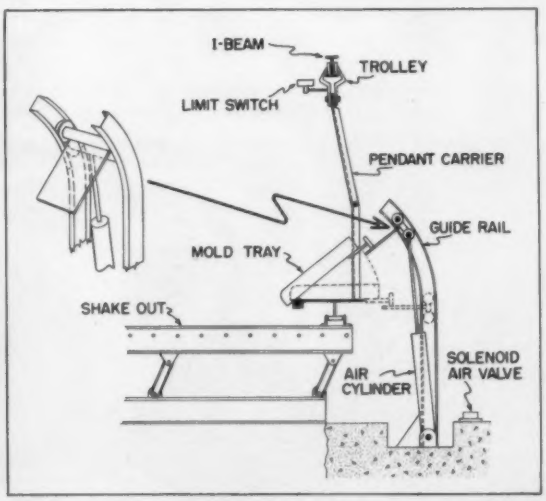


Fig. 6. A limit switch and solenoid air valve help trip trays

Climate's Fine for Plant Pools

Prefab Aluminum Keeps Cost, Maintenance Down

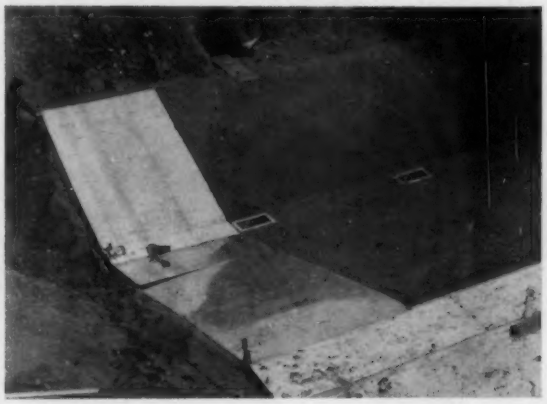
RECREATIONAL FACILITIES are being given top priority in many industrial plants today. Many plants located in urban or suburban areas are even thinking in terms of swimming pools. Space is, of course, a basic requirement for any pool, but their high cost, plus the undoubtedly heavy maintenance expenditures necessary, have been a deterrent to more widespread installation of plant pools.

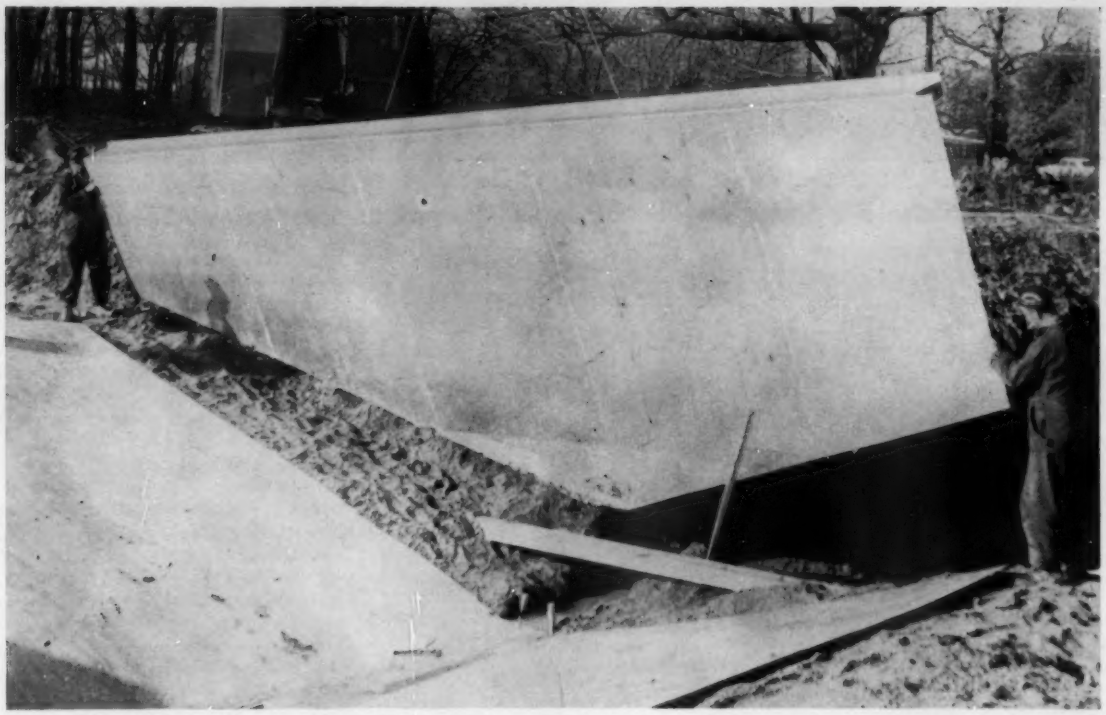
One of the more recent developments which is wiping out some of these expenses is an all-aluminum pool, shop prefabricated. The pool, produced and installed by Chester Products Co., Hamilton, Ohio, can be had in practically any size. According to the manufacturer, the pool would cost approximately $9.00 per square foot. This price includes installation of the unit along with integral plumbing, diving boards, filters, chlorinators, vacuum cleaner, all-concrete deck for walk area equal, in square foot size, to that of the pool, lifeguard chairs and underwater lights.

One of the advantages of thick plate aluminum from which the pools are made is freedom from rust and corrosion. Newest aluminum welding techniques are employed in final steps of installation.

Setting the first section in the bottom of the diving "L." Boxes in foreground are main drains at deepest point of pool

First part of the leg of the pool bottom takes shape. Exact positioning is required before welding takes place





This photo shows advantages of plant prefabrication of pools. Side of diving "L" arrives on site, is positioned in one piece

Timeliness in planning of swimming pool installations is said to be most important. For example, an outdoor pool can be installed during early fall, late winter and early spring months. At these times weather is generally favorable and other recreational facilities are not tied up by the construction, and adequate time for complete landscaping is available before swimming season begins.

Installation photographs on these pages illustrate some of the unit's construction features. Specially-formed aluminum extrusions have been combined into a 1-ft. wide roll-out ledge with a covered drain gutter forming a structural shape which adds to its strength. In addition, the roll-out edge aids in easy egress from the pool on any side. It also provides a simplified method of skimming leaves and other floating debris from the surface by merely raising the water level above the ledge.

Economical methods of transporting and installing the pools probably has a great deal to do with their comparatively low cost. They are shipped to the site in prefitted parts that are lifted into place with a portable crane.

First, the site is prepared as shown in the accompanying photographs. Ground tile is laid and a 6-in. thick layer of gravel is placed. All of this takes place on the first day of installation. On the second day, the crane enters the picture and lowers the heavier component pieces into place. Welding is then taken care of by men experienced in aluminum welding.

On the third day (in some cases the job may take a bit longer) the backfilling of the pool takes place, the grading of the surrounding area is finished, the plumbing is connected and the pool is ready for action—when the weather's warm enough.

Once bottom and side sections are positioned and tack-welded, aluminum welders hasten completion of the pool

Shallow end of pool showing integral water inlet piping and reinforcing buttress. This area will be backfilled later

NEW DEVELOPMENTS

Low Cost Tube Expander Drive Measures Torque at the Output Spindle

Handled like a conventional flue roller, the Torq-Air-Matic is reported to cost less to buy and maintain. A swiveling auxiliary handle (not shown) goes with it

AN ALL-AIR DRIVEN rotating-type tube expander drive, the Torq-Air-Matic, announced by Thomas C. Wilson, Inc., measures torque at the output spindle—calibrated in foot-pounds. According to Wilson, this method of registering torque offers several benefits. It keeps tubes from being over-rolled or under-rolled. Readings are precise and consistent regardless of tube sheet hole variations. It eliminates overstressing of tube sheets, reduces warpage and ligament "push-over."

Designed to produce 14 ft-lb of torque at 90 psi with 12 cfm maximum air consumption, the Torq-Air-Matic is self-contained. Only connection needed is the operating air hose. The basic unit is of pistol grip design with oil reservoir built into the handle. Control section is independent of motor, and lubrication is permanent.

For more data, write "Torq-Air-Matic" on the Reader Service Card

Radio Paging System Delivers the Messages to You Privately

PRIVATE, INDIVIDUAL paging of plant personnel is the function of the Handie-Talkie, a pocket radio paging system developed by Motorola Communications and Electronics, Inc. The system alerts and informs the paged person anywhere within a restricted plant or building area and no one but the pagee knows a message is being transmitted.

A mere handful in size, the Handie-Talkie receiver weighs only 10 oz, is powered by a 4-v mercury cell battery

The system consists of a selector console with individual buttons for key personnel, and FM transmitter that radiates alerting tones and voice messages within a confined induction loop area, and the individual, all-transistorized radio receivers.

To activate a pagee's receiver alerting mechanism, the telephone operator presses the proper "alert" button; then speaks the message into a desk microphone. No other receiver hears either the alerting tone or the message.

The FM reception of the receiver unit is claimed immune to common types of interference found in industrial plants. Unit operating cost is said to be about 3 cents per eight-hour work day. Up to several hundred persons can be paged individually, it is noted, and no FCC license is required.

For more information on this, write "Handie-Talkie" on the Reader Service Card, page 201. Or write to Equipment Editor, PLANT ENGINEERING 110 S. Dearborn St., Chicago 3, Ill.

With the receiver unit clipped to his belt, this plant engineer can be paged any time — even in the noisier areas

AND APPLICATIONS

D-C Motors Offer Versatility of Application and Performance

To MEET MODERN industrial needs for faster, more continuous, more automatic production, General Electric Co. introduces the Kinamatic line of direct-current motors and generators. Built to latest NEMA standards, the line includes all motor ratings from 1 to 150 hp, all generator ratings from ¾ to 100 kw.

Kinamatic motors may be used in constant or adjustable speed applications. Speed may be adjusted by either armature voltage control, field strength control, or any combination of both. New higher base speeds are available. For constant horsepower applications, higher top speeds can be obtained through field strength adjustment.

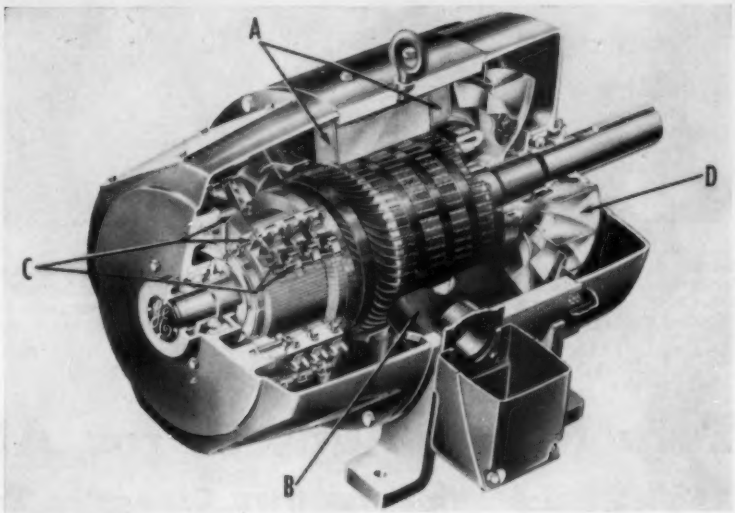
These motors can also be applied where extra power at high speeds is needed. Through "forcing" — application of over-voltage — many ratings can operate at proportionately higher speeds and horsepower. When properly applied, the d-c Kinamatic motor can operate at any speed below base speed, GE points out, including stalled torque.

Faster speed of response is attributed to a reduction in armature inertia and electrical time constant to permit split-second response for quick stops and starts and fast reversals and speed changes. Peak commutation, to take the short bursts of power needed for quick acceleration and deceleration, is built in. Fewer turns per armature coil serve to assure minimum inductive kick when stored energy is released from the coil, and a full complement of commutating poles permits greater overloads without magnetic saturation.

Full Class B insulation, a high volume fan and improved air flow enable General Electric to guarantee a 15 per cent service factor in standard drip-proof Kinamatic motors. You can take advantage of this three ways: to obtain 15 per cent more rated power continuously for normal life of the motor; to obtain longer motor life at rated power; or to obtain more versatility on speed and horsepower duty cycles.

Streamlined in design, the standard Kinamatic motor has a rolled steel frame, cast iron drip-proof endshields. An average of 33 per cent increase in horsepower per pound is offered. To cope with wiring connections, three sizes of conduit boxes are available.

D-c motor maintenance is reduced and simplified in the Kinamatic line, says GE. Brushes are easily reached through large hand holes. Brass brush-holders and molded polyester glass yokes provide a corrosion-resistant brush rigging assembly. Ball bearings are packed with a lubricant expected to last many years under normal conditions and handy grease fittings permit re-lubrication without disassembly.



Kinamatic cutaway shows exciting and field coils (A and B) insulated with inorganics, encapsulated in polyester compound; (C) brush rigging; (D) aluminum fan

For full data write, "Kinamatic" on the Reader Service Card, page 201

Brush rigging includes bronze brush-holders with broached carbon ways

In the Kinamatic, large hand holes permit easy access to the commutator

Regular, undersize and oversize conduit boxes may be had for each frame

St. Louis meeting. Seated, l to r: W. F. Allison, Emerson Electric Mfg. Co.; M. H. Lau, Anheuser-Busch, Inc.; J. V. Lammers, ACF Industries, Inc.; R. T. Wood, Automatic Transportation Co.; and G. F. Benjamin, Jr., Monsanto Chemical Co. Standing, l to r: D. E. Gers and A. Other, both of Waxide Paper Co.; R. Marinello, Plant Engineering magazine; W. Overbey, Carter Carburetor Co.; R. Dickson, Plant Engineering magazine; R. E. Mansfield, Vickers Electric Div.; and M. G. Breiner, Lever Bros. Co. of Waxide Paper Co. D. E. Gers, was appointed temporary chairman

Two New Chapters for AIPE

Members-at-Large Form Own Groups in Two Areas

ST. LOUIS and Merrimack Valley (Massachusetts) are the two new groups that recently applied for chapter membership in the American Institute of Plant Engineers.

Members-at-Large of the AIPE in the St. Louis area held an organizational meeting on December 15 at the Chase Hotel. At this meeting, they decided to form the St. Louis Plant Engineers' Society and also make application for chapter membership in the national plant engineers' group.

David Gers of Waxide Paper Co. was appointed temporary chairman and John Lammers of ACF Industries, Inc., will serve as temporary secretary until the election of permanent officers.

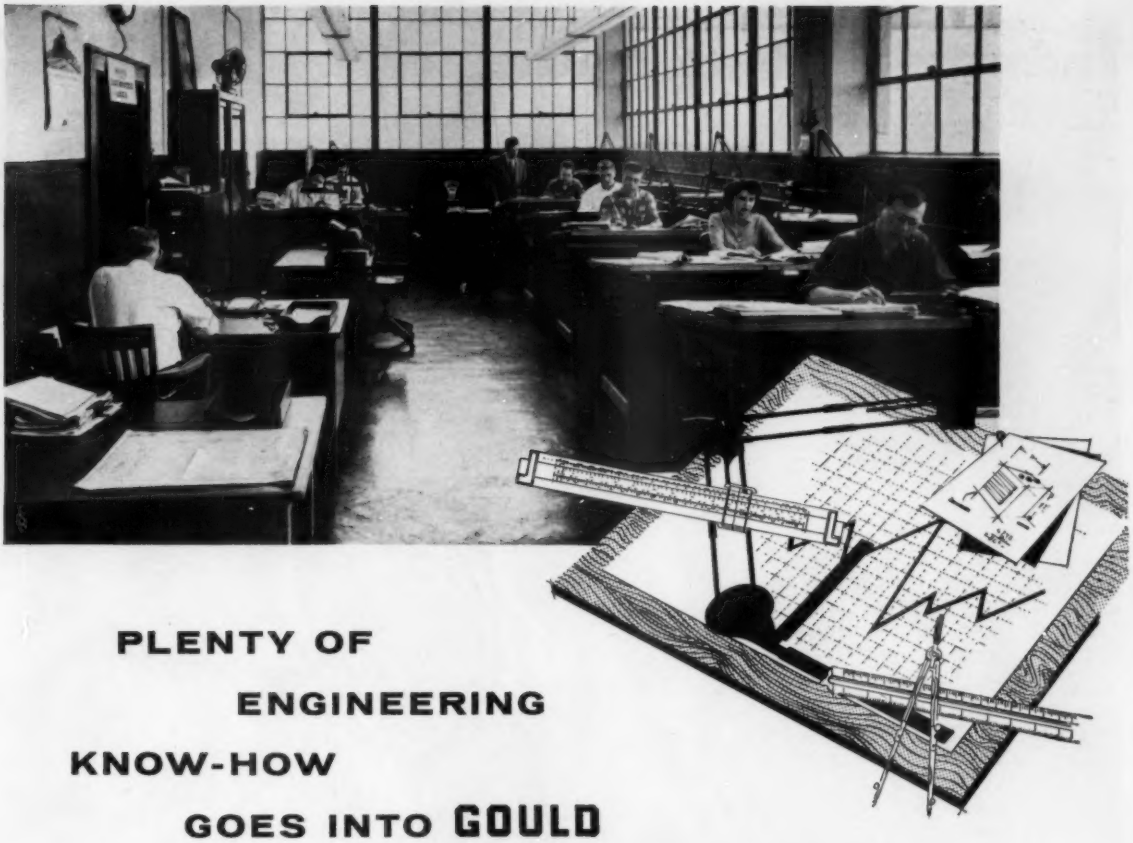
Merrimack Valley

On January 9, 1956, Members-at-Large of the AIPE from the Merrimack Valley area held an informal dinner meeting to discuss the formation of a Plant Engineers' Society for their area.

In addition to organizing the Merrimack Valley Plant Engineers' Society, they also indicated their desire to become a chapter of the AIPE. This is the twenty-eighth Plant Engineers' Society that has affiliated with the American Institute of Plant Engineers.

J. F. Erwin of Western Electric Co. was appointed president; J. R. Merrill, of J. F. McElwain Co., will serve as vice president; with R. Lucier, of Commodore Foods, Inc., assuming the duties of secretary-treasurer.

Merrimack Valley meeting. Seated, l to r: A. W. Citro, Metal Fabricators, Inc.; R. C. Mounsey, Birds Eye Division; J. M. Kohr, Gorton-Pew Fisheries; H. E. B. Anderson and R. H. Morris, Plant Engineering magazine; J. F. Erwin, Western Electric Co.; L. J. Monty, Artisan Metal Products; and S. S. Thorpe, Lowell General Hospital. Standing, l to r: F. E. Smith, Merrimac Hat Corp.; C. Crocker, CBS-Hytron; T. R. Chase, New England Wood Heel Co.; H. H. Hallas, Chase-Shawmut Co.; J. M. McClung, Champion-International Co.; R. Lucier, Commodore Foods, Inc.; J. R. Merrill, J. F. McElwain Co.; and W. J. Taggart, Sprague Electric Co. Mr. Erwin, of Western Electric Co., was appointed president



PLENTY OF ENGINEERING KNOW-HOW GOES INTO GOULD RESEARCH BUILT BATTERIES!

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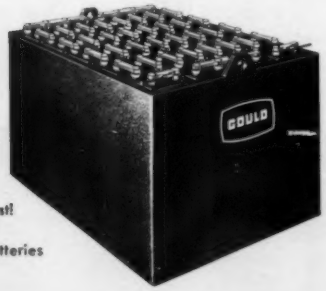

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Industrial Hose Delivers the Goods

This Rubber Pipe Stands Pressure, Heat and Vibration

Fig. 1. Wire braid hose carries steam at 375 F, 175 psi and cold water to a press used in making phonograph records

USE OF RUBBER hose poses at least two general requirements affecting the plant engineer. One calls for a standard multi-purpose hose for the numerous standard industrial hose tasks such as carrying air, water and steam at common pressures and temperatures to reduce the number of hose types which must be kept on hand to a minimum. The second involves the question of performance in new applications such as carrying new materials or standard materials at higher than ordinary pressures and temperatures.

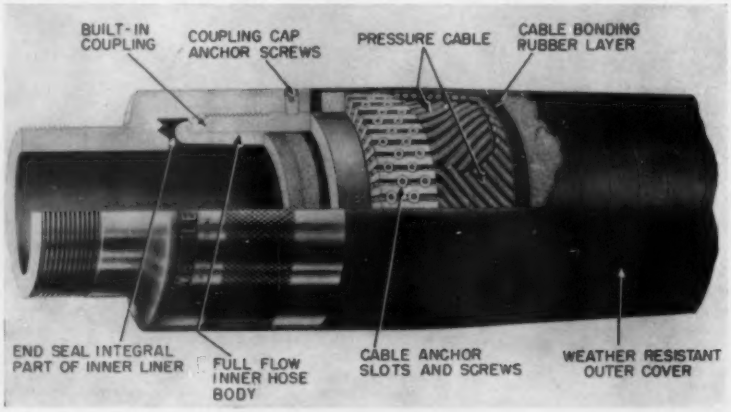
The introduction a few years ago of standard multi-purpose hose types by several manufacturers and even a line of five basic hose by Thermoid Company has solved the standard hose problem. Eighteen separate hose types, for instance, were combined into five to serve 90 per cent of the common hose applications.

Two advances have been made in designing and manufacturing hose for high pressures use. In automation and remote control of machine parts, hydraulic hose delivers fluid at high pressures to actuate assemblies at points remote from the control station. There is movement of the parts connected to the hose, otherwise, a flexible connection would not be specified.

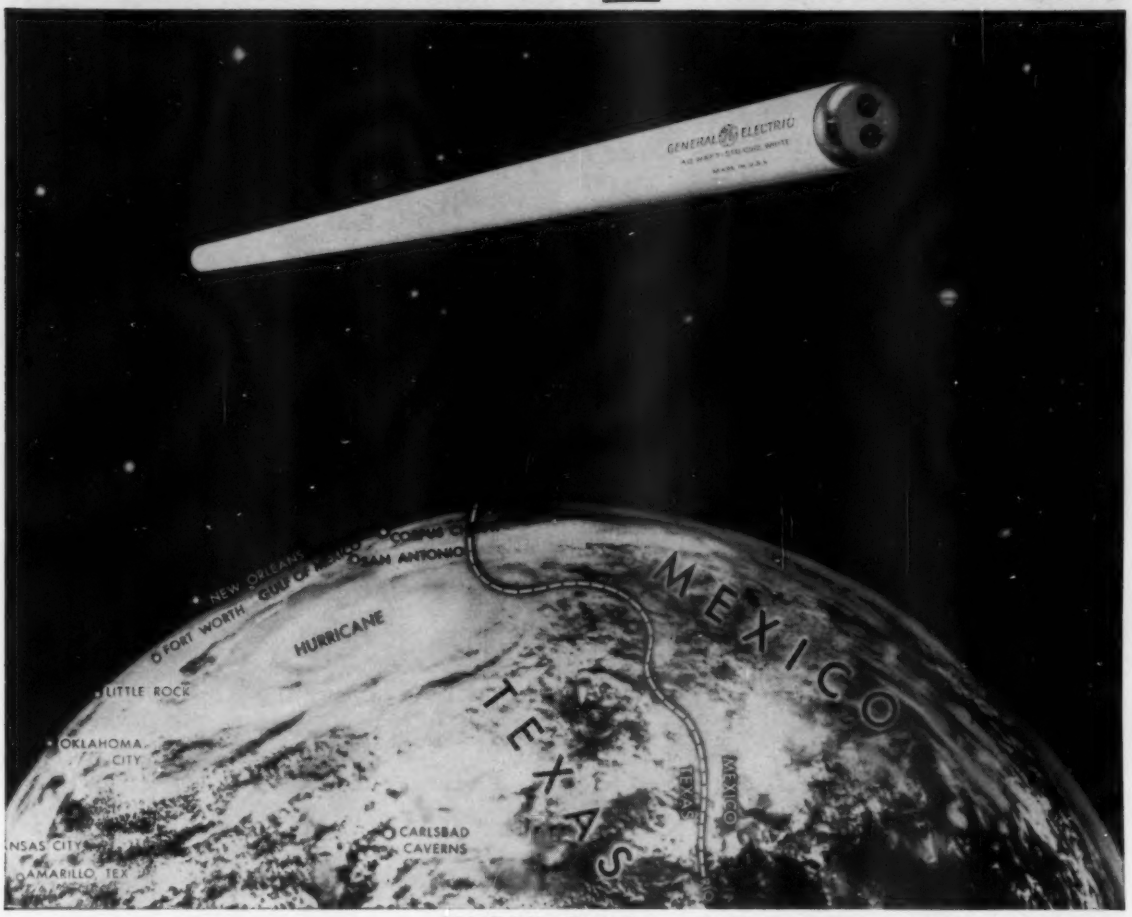
It is an easy task to design a hose with enough reinforcement to withstand high hydraulic pressures up to 4500 psi. The difficulty lies in achieving pressure capacity together with a workable bending radius. The space available in automatic machines is extremely limited so that large loops of hose cannot be tolerated. The bending radius must be small. Modern hose may safely be bent in a radius of one foot for every inch of inside diameter.

Another important factor in hydraulic hose applications is the per cent

Fig. 2. This design allows unrestricted flow through high pressure coupling


BUILT-IN COUPLING
COUPLING CAP ANCHOR SCREWS
PRESSURE CABLE
CABLE BONDING RUBBER LAYER
END SEAL INTEGRAL PART OF INNER LINER
FULL FLOW INNER HOSE BODY
CABLE ANCHOR SLOTS AND SCREWS
WEATHER RESISTANT OUTER COVER

G-E LAMPS GIVE YOU MORE FOR ALL YOUR LIGHTING DOLLARS



Official U.S. Navy Photograph, a composite of photos taken from a rocket at approximately 100 miles altitude.

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Fig. 3. Hose-equipped grit unit for equipment blast-cleaning

Fig. 4. Vibration, misalignment problem solved by hose use

change in length under pressure. Braided hose will contract or expand under pressure depending on the grade. Spirally-wound mandrel-built hose will elongate. Modern hose design and manufacturing techniques permit expansion or contraction to be controlled and limited to small amounts.

In addition to hydraulics, hose is increasingly used in high pressure work to convey materials in substantial quantities. This means hose of large diameter compared with hydraulic hose, up to 6 in. ID. The biggest problem presented by large diameter hose of this type is attaching the couplings to the hose. Burst resistance of the hose is taken care of by spirally-wrapped steel cables but preventing couplings from separating from the hose itself is more difficult.

A special coupling has been designed for this type of hose that is positive. The ends of the reinforcing steel cables are drawn through slots milled from a solid steel tube and secured with set screws. See Fig. 2. The steel tube extends beyond the slots a few inches in both directions. The outer end is threaded to receive the coupling cap which seals off the hose tubing extending through the slotted sections. The cap is also threaded for attaching to the machinery served.

The result is an integral hose unit with couplings fixed by positive mechanical means to the hose proper. The outside diameter of the hose at the coupling is only slightly larger than the OD of the hose proper. The slight increase in diameter is achieved gradually and smoothly without projecting ridges, flanges, bulges or sharp change in diameter.

The lumber industry uses hose of this type with integral couplings to bring water at 1500 psi in large quantities to a log-debarking ring. Fig. 5. Water jets from the rotating ring and removes the bark. The ring must be capable of movement to follow the crooked contours of logs and for maintenance which requires a flexible connection, similar to those in Fig. 6.

With the great increase in heavy construction of new plants, office buildings and highways, a need has developed for a special pipe-driver hose to handle steam. The principal specifications to be met in this application were: ability to handle saturated steam at 385 F, 200 psi, without sudden bursting, protection against the build-up of static electricity to permit working in areas where flammable liquids are present, and insulation to reduce heat loss. Steel wire braiding provided the burst resistance, bonding the steel braiding to the couplings gave a static ground and one ply of asbestos was incorporated as insulation.

Fig. 5. Hose at lower right carries water to rotary debarker

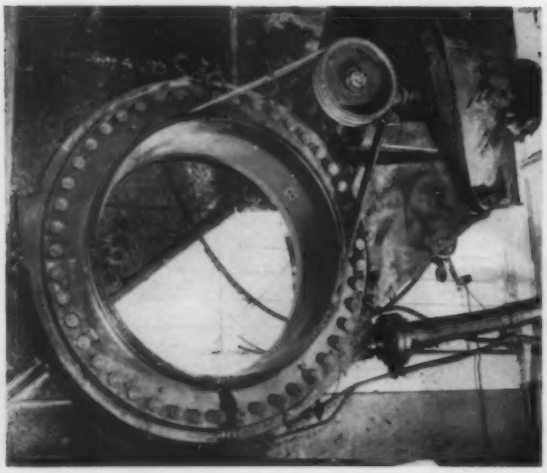

Fig. 6. Continuous piping breakage stopped by hydraulic hose

Changing basic designs to match the specifications of different machines or models is a fast, easy routine at Cleveland Trencher Company, Cleveland, Ohio—thanks to Kodagraph Autopositive Paper.

8 modifications of the original design

without a minute wasted on redrafting

In the case of the transmission design drawings shown above, eight separate modified designs were required. So a like number of Autopositive Paper intermediates were made *instead of redrafting time after time.*

To each of these intermediates—with dense black photographic lines on a translucent base—the draftsman only had to add the variables and correct dimensions.

The Cleveland Trencher Company finds other important uses for Autopositive Paper intermediates—uses them instead of valuable original drawings in direct-process print production and in the "changes pending" file to show proposed revisions.

Another drafting-room favorite is Kodagraph Autopositive Film, which speeds the production of parts books illustrations. Complicated paste-ups are reproduced in exceptionally fine detail on this translucent film, which is used to produce direct-process prints or offset plates.

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Hydraulic Elevator Lifts Railroad Car Loads—Car and All

AN UNUSUAL HYDRAULIC ELEVATOR was recently put into operation at the Humko Co., Memphis, Tennessee, producers of vegetable oils and shortening. It is capable of lifting a section of railroad track, including a fully loaded boxcar, to the second floor of the Humko Company building.

Depending upon the particular product to be unloaded, the 12-ft by 60-ft steel platform can be elevated flush with the second floor, or it can be stopped with the boxcar door flush with the floor.

The elevator pit was built on a rail spur that passes through the building. Sixty feet of standard gage track is built into the platform, which weighs 65,000 lb and has a net load capacity of 120,000 lb, when the load is centered.

Application of the hydraulic elevator was a key phase in an expansion program at the plant. Available surface space was limited, and horizontal growth was impossible. With the new elevator in use, the entire ground floor of the building is available for manufacturing area, while the second floor can be utilized for storage of raw materials.

Hydraulic power for the elevator is dependent upon two Worthington rotary gear pumps, each driven by a 40 hp motor through v-belts, and rated at 230 gpm at 960 rpm. Both pumps take suction from an overhead reservoir, and discharge into a common header.

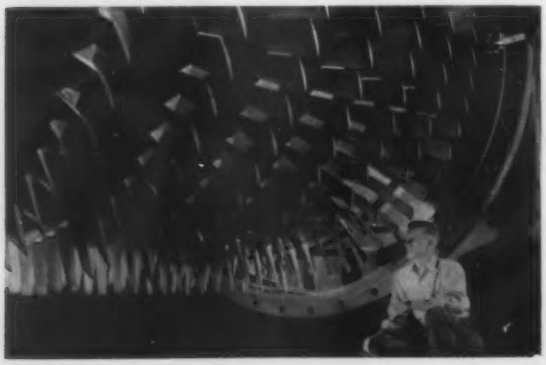
Electronic Tester Gets "Under the Skin" of High Voltage Cable

NEW ELECTRONIC test equipment that detects and locates imperfections in rubber-insulated high voltage cables, not revealed by other test methods, is in use at the Okonite Co., Passaic, N.J. Named the "Gooding Test Train" for its inventor, F. H. Gooding of Okonite, the equipment consists of three separate units arranged in series.

First, a uniformity gage continuously checks the thickness of the insulation and locates any areas with thin spots which might cause premature failure. Second, an ionization test unit checks every inch of the cable at a predetermined voltage to measure the corona level at any spot along the cable. The voltage used is sufficient to assure that the corona level at every point is at least 1½ times the rated voltage. Third, an x-ray test unit provides internal inspection of the cable by a 250,000 volt x-ray machine. It is used primarily to determine the nature and extent of flaws indicated by the thickness and ionization units. All rubber-insulated cable manufactured by Okonite for operation above 4000 volts is now subjected to the three-way test.

Ultrasonic Speed Wind Tunnels Call For "Ultra-size" Equipment

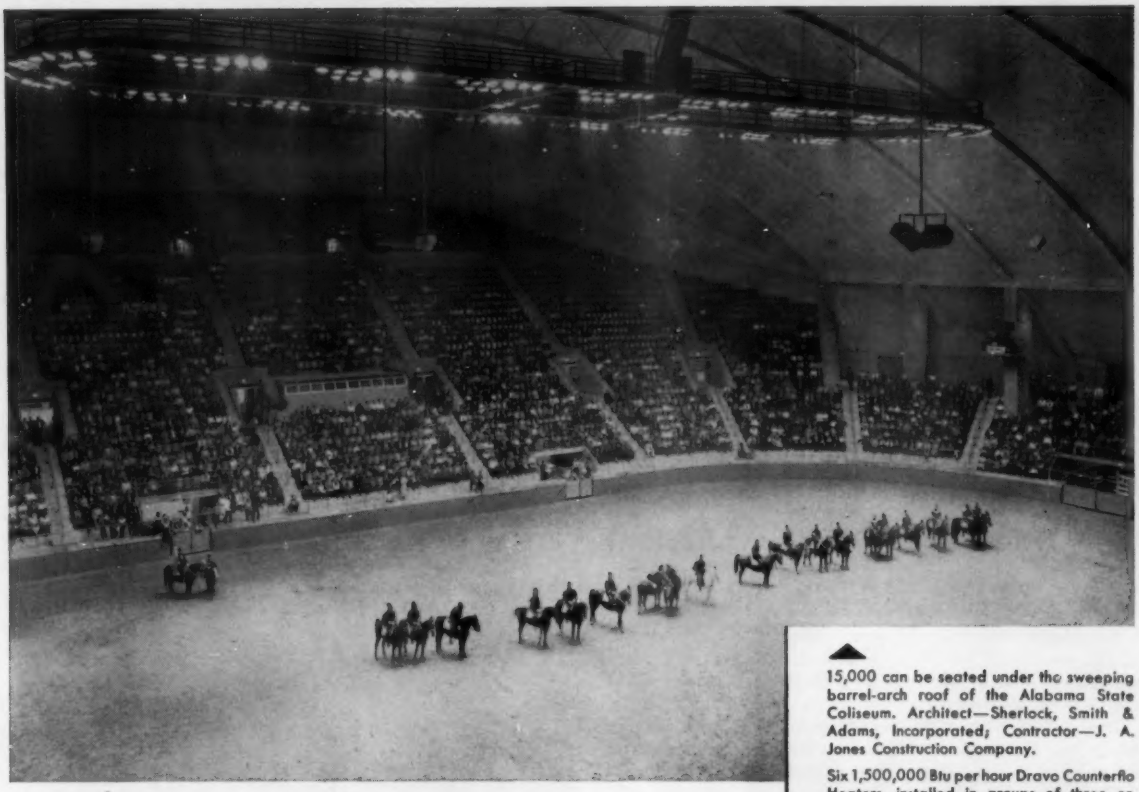
ATTAINING TRANSONIC, supersonic and hypersonic air speeds within air tunnel test sections is a function of the facilities at the Arnold Engineering Development Center, at Tullahoma, Tennessee. More than 4½ million cfm is the combined rating of the axial and centrifugal compressors and exhausters of Allis-Chalmers manufacture to be installed at the Center to develop the pressure ratio necessary to attain the speeds required.



The air being handled by the equipment is enough to supply the entire population of a city the size of Boston, with a combined rating of 300,000 hp will be used in the operation.

Under full operating conditions, the Center will require 500 to 700 million kwh of electricity each year. This power will enter the facilities through a bank of Allis-Chalmers 3,500,000 kva oil circuit breakers. This 161,000 volt power will be stepped down by transformers and substations to the voltages required for drive motors and auxiliaries in the Engine Test Facility and Propulsion Wind Tunnel Plenum Evacuation system at the Center.

To simulate high altitude flight conditions, a 1,000,000 cfm axial compressor will be used in the Ramjet test facilities. Functioning as an exhauster, the compressor will be driven by a 24,500 hp synchronous motor and a 6000 hp wound-rotor motor used for starting and supplementing the main drive motor.



15,000 can be seated under the sweeping barrel-arch roof of the Alabama State Coliseum. Architect—Sherlock, Smith & Adams, Incorporated; Contractor—J. A. Jones Construction Company.

Six 1,500,000 Btu per hour Dravo Counterflo Heaters, installed in groups of three on opposite sides of the arena, operate automatically to provide heat as needed. A seventh Dravo Counterflo, rated at 500,000 Btu per hour, heats the basement.

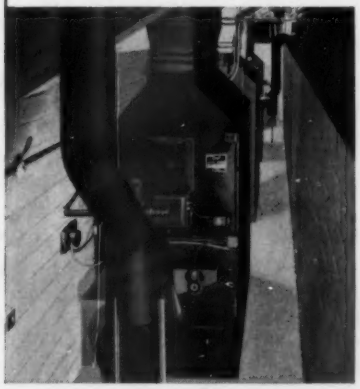
How Alabama solved unusual heating problems in its new Coliseum

Keeping the new Alabama State Coliseum at Montgomery comfortable posed many unusual problems for heating engineers. Size alone presented a big enough problem—the building is 10 stories high and almost the length of an average football stadium—but added were many special conditions.

When the building is empty heat loss amounts to 9,800,000 Btu per hr, but when filled, body heat sometimes raises temperatures enough that heat and humidity must be removed. The large open area also makes it difficult to provide uniform, easily controlled heat at all seating levels. Other rigid requirements include concealment of heaters to permit unobstructed visibility and quiet operation. With the aid of seven Dravo *Counterflo* Heaters the engineers solved all these problems.

Installed under the stands of the arena are six Dravo heaters that pull in fresh and return air in proportion to the Coliseum's needs. This air is quickly heated by the Dravo units and quietly distributed to all parts of the building. Functioning with the heaters is a sensitive temperature-humidity control system that operates the heaters or a series of exhaust fans, according to on-the-spot heat-ventilation requirements. The fully modulated *Counterflo* Heaters, with their stainless steel combustion chambers, are ideally suited for this precise job of providing instantaneous heat delivery when needed—or fresh tempered make-up air when ventilation is required.

Just as they've economically solved the unusual heating problems in this huge Coliseum, Dravo heaters can effectively meet your needs, large or small. For fast proof, use the coupon.



Dravo Corporation, Department A-1303
Fifth & Liberty Avenues
Pittsburgh 22, Pa.
I am interested in Dravo Heaters for

_____

☐ Please send literature
☐ Please have a representative call

DRAVO
CORPORATION
Pittsburgh 22, Pennsylvania
Representatives in principal cities

Name _____

Company _____

Address _____

City _____ Zone _____ State _____

For more facts circle 573 on Reply Card

Fire-Resistive Mastic Proves Its Qualities in Test Panel Fires

As THE USE of thermal insulation grows, for pipes, vessels, ducts, turbines and other equipment, so does the need to protect the insulation from weather and chemical abuses. As a result, mastic weathercoatings, usually based on flammable asphaltic resins, have found extensive use.

Incidents of fire in these asphaltic resin base coatings led to the development of a mastic coating which is fire-resistive. To demonstrate its effectiveness against flame, the mastic is thoroughly tested by its makers, Benjamin Foster Co., Philadelphia. The test demonstration shows, on large-area samples, the fire retardant difference between asphalt weathercoats and this new non-asphaltic fire resistive mastic. In addition to resisting the spread of flame, mastic smolders only briefly after flame is removed.

Separated by fire walls and an open area, two flat panels of insulation, faced with ¼-in thick asbestos cement board, were sprayed with asphaltic and non-asphaltic mastics, then subjected to the flames from burning oil-soaked rags at the base of each panel. After less than a minute of exposure, the panels showed the results as pictured with fire-resistive mastic sprayed on panel at right of the test assembly.

Seagoing Derrick Makes Record Lift of Oil Drilling Platform

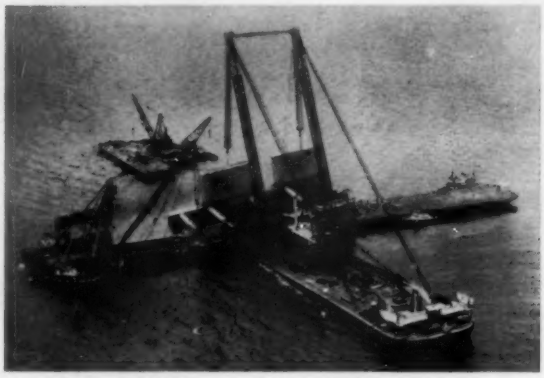
SPECIALLY DESIGNED to meet the special requirements of the petroleum industry, a new derrick recently lifted a record weight of 800 tons in a single load, operating in the Gulf of Mexico.

Installed aboard a 90-ft by 300-ft barge, the derrick easily surpassed the best previous lift by the block and fall method, estimated at 400 to 500 tons.

For offshore drilling, engineers are faced with the problem of constructing platforms in the Gulf itself. The superstructures are fabricated on shore, then barged into position for mounting on the base.

Assignment of providing a machine to handle the huge prefabricated platform sections was given to the American Hoist & Derrick Co., St. Paul, Minnesota, and their solution resulted in the construction of a sheerleg derrick.

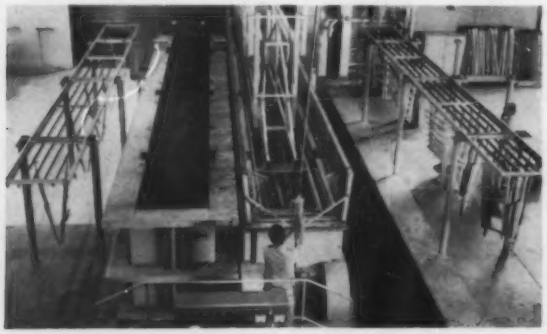
Stationed on the stern of the barge, the derrick, 240 ft high, is supported by cables going back to two hoists on the other end of the barge. In spite of its size, the derrick can be dismantled or erected in a relatively short time.



Complexity of the derrick construction is indicated in figures which show that 2,000 tons of steel and 40 tons of welding rod were used in fabricating the barge, and when completely rigged for work, the derrick requires nine miles of wire rope in sizes up to 2½ in. in diameter.

Cleaning and Surface Treating of Aluminum Now a Two-Tank Job

PREVENTION OF CORROSION and abrasion of aircraft aluminum parts, and surface treatment for paint adhesion, is being accomplished at the El Segundo Division of Douglas Aircraft Co., by the use of a new cleaning and treating machine called an Auto Cycler. It completes the job in two-thirds the time formerly required, in only two tanks, as compared with ten tanks in the older system.



The unit occupies 600 sq ft of floor space, which represents a reduction of 1400 sq ft from the old setup. It is 31 ft long, 3 ft wide and 7 ft deep, big enough to handle the largest skins or spars used in the plant's production.

The cleaner embodies the basic concept of treating stationary parts with sprayed solutions in a continuous automatic cycle of operations. Parts are carefully racked to insure that the solutions thoroughly contact all surfaces, and are firmly anchored to prevent movement during the bombardment of the high-velocity liquids used in cleaning.

Pressing a button, the operator starts the 22-minute cycle with a wash using hot water and an alkaline cleaner to remove any soil or markings that may be on the surface.

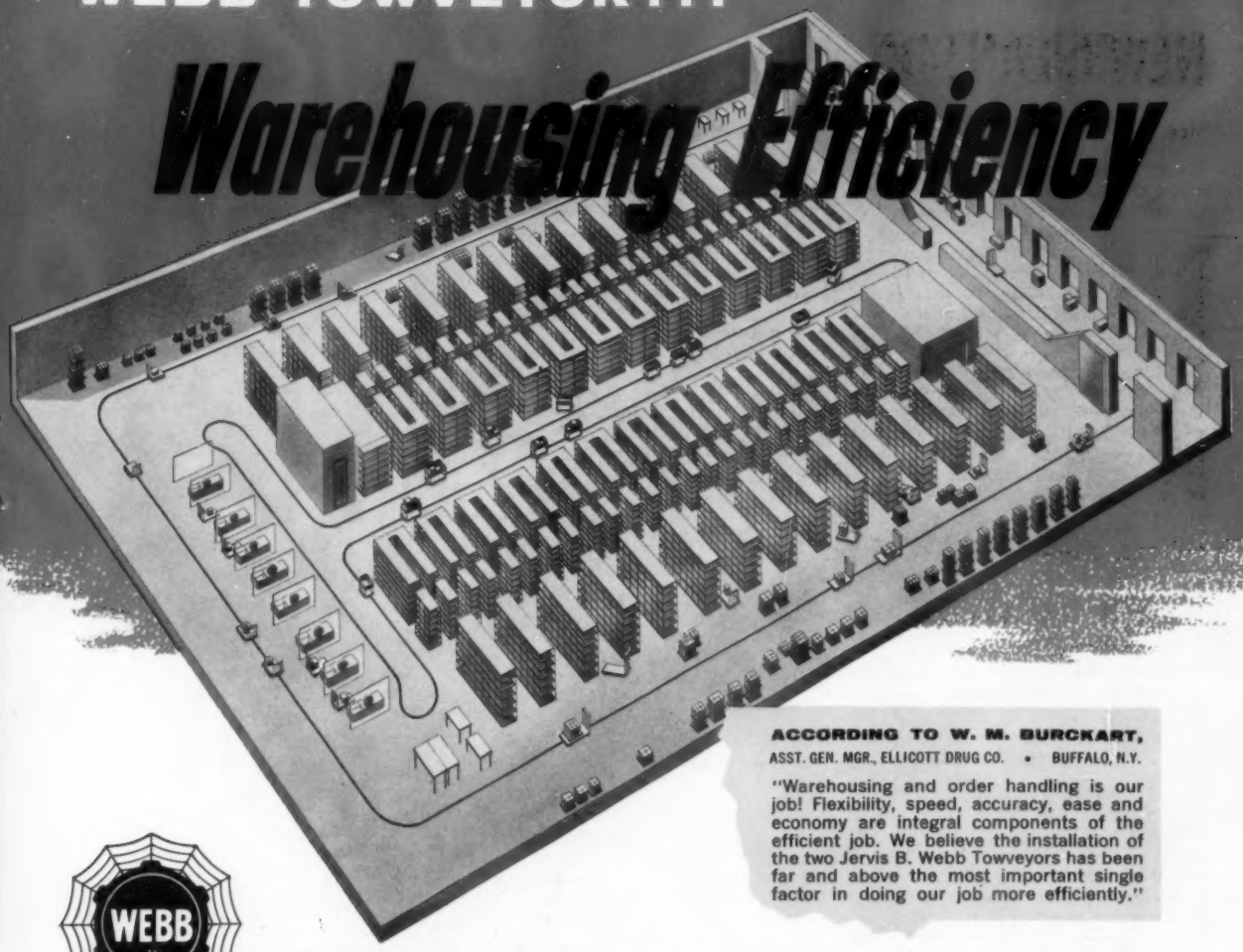
Impellers in the bottoms of the tanks throw a solid curtain of cleaning fluid on the parts when they are placed in the tank. A hot, then cold, rinse removes soap and dirt.

An acidic solution is applied to the parts, which are then rinsed and dried by hot air blown into the tank.

For more facts circle 574 on Reply Card ——→

WEBB TOWVEYOR*...

Warehousing Efficiency



ACCORDING TO W. M. BURCKART,
ASST. GEN. MGR., ELLICOTT DRUG CO. • BUFFALO, N.Y.

"Warehousing and order handling is our job! Flexibility, speed, accuracy, ease and economy are integral components of the efficient job. We believe the installation of the two Jervis B. Webb Towveyors has been far and above the most important single factor in doing our job more efficiently."

The Ellicott Drug Company—wholesale druggist in Buffalo, N.Y.—services hundreds of drug stores in Northwestern Pennsylvania and Western New York State. They warehouse well over 30,000 items. This warehousing job, combined with the need for rapid filling of complex orders, could present a difficult materials handling problem. But it doesn't.

Two Webb Towveyors . . . totaling almost ½ mile in length . . . have contributed greatly to the simplification and increased efficiency of their warehouse operation. Since installing the Webb Towveyors, order handling volume has increased. Orders are now filled at the rate of one order every two minutes. In emergencies, this pace can be increased.

A continuous Towveyor line runs around the perimeter of the warehouse serving two purposes, (1) delivering goods from the receiving dock to the storage area, and (2) delivering completed orders from the packing tables to the shipping dock. This conveyor line also moves rubbish to the incinerator . . . often a warehousing problem. The second Towveyor line runs in a continuous "T" shaped circuit through the center area of the warehouse between two long banks of stock-storage shelves . . . 55,000 sq. ft. of shelving . . . and to the packing area. This line is used by order clerks to fill quickly odd-lot customer orders for shipment or pick-up.

Towveyors are underfloor chain conveyors using standard trucks with tow-pin attachment. The typical simplicity of the Ellicott system; the absence of surging and rocking motion; the fast, dependable, silent and clean operation . . . necessary for this type of warehousing . . . are the prime reasons why Ellicott considers Towveyors the utmost in efficient materials handling.

Let Webb engineers show you how a Towveyor system can bring you added profits and better materials movement . . . whether your operation is a warehouse or a production plant.

Visit us at: Material Handling Institute's Exposition . . . Cleveland, June 5-8, 1956 . . . Booths 110, 112, 209 and 211

****Towveyor is a registered trademark, identifying floor truck conveyors, patented, manufactured and installed by the Jervis B. Webb Co.***

JERVIS B. WEBB CO.

Specialists in Custom Conveyor Systems

8933 ALPINE AVENUE • DETROIT 4, MICHIGAN

OFFICES AND REPRESENTATIVES THROUGHOUT THE WORLD • FACTORIES: DETROIT • LOS ANGELES • ATLANTA • HAMILTON, ONTARIO, CANADA

NEW PLANT CONSTRUCTION — advance information on location, costs

Pine Bluff, Ark.—Dierks & Forests, Inc., Kansas City, Mo., has announced plans for the construction of a new paper mill on a 1480-acre tract of land along the Arkansas River, five miles northeast of this city. The plant is scheduled to be in operation by September 1957. Installation will represent a multi-million dollar investment.

Hawthorne, Calif.—Northrop Aircraft, Inc., has approved plans for major expansion of company's plant facilities, and work will begin at once on new $5,300,000 engineering center. New research facility of 250,000 sq ft will house in one building all Northrop engineers, now scattered in several locations.

Stamford, Conn.—Pitney-Bowes, Inc., has approved plans for addition to present facilities here with 200,000 sq ft addition to main plant and offices. Addition reported to cost $3,000,000.

Windsor, Conn. — Combustion Engineering, Inc., 208 Madison Avenue, New York, N. Y., has approved plans for the erection of a new nuclear engineering and development center on company's site of 530 acres. Cost reported in excess of $5,000,000.

Wilmington, Del.—E. I. Du Pont de Nemours & Co., Inc., has announced a $5,000,000 expansion program on three projects to increase company's output of titanium dioxide by more than 25 per cent. Program includes expansion of present facilities at Baltimore, Md., and two projects at the existing Edge Moor, Del., plant.

Rockford, Ill. — The National Lock Company, a subsidiary of Keystone Steel & Wire Co., Peoria, Ill., producers of hardware and component parts for automobiles, electrical and other household appliances, furniture and aircraft, has plans under way for the construction of new screw and bolt plant which will boost company's total floor area in Rockford to 1,600,000 sq ft at an estimated cost of $5,000,000.

Lake Charles, La. — Continental Oil Co. and Cities Service Co. have authorized plans to increase the capacity of their butadiene plant. Work on the project is under way and is scheduled for completion in the fall. Output of the plant will be boosted to 79,000 tons from the present total of 63,000 tons at a reported cost exceeding $4,350,000.

Norco, La.—The Shell Chemical Corporation, 50 W. 50th St., New York, N. Y., has announced plans for the construction of a new methyl ethyl ketone plant near here with an annual output of 40,000,000 lb. Work on new plant is to begin at once with production scheduled for early 1957.

Detroit, Mich.—The Briggs Manufacturing Company, subsidiary of Abingdon Potteries, Inc., Buhl Building, has announced plans for company expansion and building program. A new steel enameling plant will be erected on company's 15 mile road property in the Detroit area, adjacent to company's present stamping division which started operation approximately a year ago. The new plant and proposed office building will have an area of about 300,000 sq ft. Construction will begin soon and plant is expected to be in operation late in 1957. Cost of plant and equipment to be in excess of $5,000,000.

Owego, New York—The International Business Machines Corp., 590 Madison Ave., New York, N. Y., has approved plans for the construction of a new military products facility on company's 670-acre site. Initial construction will consist of three engineering and manufacturing buildings comprising 400,000 sq ft of floor space. Construction will begin soon.

Middletown, Ohio — Armco Drainage & Metal Products, Inc., subsidiary of Armco Steel Corp., 1939 Armco Ave., has authorized plans for the erection of new plant for the construction of new line of pre-fabricated steel buildings. Plant will be a prototype building with unique design features of prefab buildings that will be manufactured by Armco. Cost reported to be $1,500,000.

Toledo, Ohio—The Dana Corporation, 4100 Bennett Rd., has approved plans and work is already under way on its first post-war expansion of company plant at local site. New 125,000 sq ft addition will be used for the production of truck transmissions and will represent investment of $2,000,000.

Boyerton, Pa.—Tung-sol Electric, Inc., 100 Eighth Avenue, Newark, N. J., manufacturers of incandescent electric lamps, television and radio tubes, and current intermitters and relays, has approved plans for the construction of new plant with a floor area of 150,000 sq ft for the production of automobile sealed beam headlamps. Work is scheduled to begin at once with completion expected by late 1956. Cost of plant and equipment to exceed $2,000,000.

Harrisburg, Pa.—Republic Steel Corporation, 1405 Republic Bldg., Cleveland, O., has approved plans for the construction of new plant near here, for the production of riveted corrugated metal drainage products. Work is scheduled to begin soon.

Pittsburgh, Pa.—The Aluminum Company of America, 1200 Alcoa Bldg., has announced plans for the addition of a 44-in. rolling mill to existing aluminum alloy sheet rolling equipment at Aluminum Company of America's Alcoa Tennessee works. Construction of plant extension will begin this spring for completion early in the fall of 1957 at a cost in excess of $4,000,000.

Athens, Texas—Olive-Myers-Spalti, Texas furniture manufacturers, has approved plans and preliminary work is already under way on the construction of new one story, windowless, furniture plant. The plant, containing 233,000 sq ft of floor area, will be built with the attempt to adopt the assembly-line method of automobile making to the furniture industry. Cost reported $2,300,000.

Odessa, Texas—The General Tire & Rubber Co., Akron, O. and the El Paso Natural Gas Co., Bassett Tower, El Paso, Texas, have announced a joint venture in the construction of a synthetic rubber producing plant near here. Construction will begin at once with production expected to get under way about July 1, 1957. Cost reported about $28,000,000.

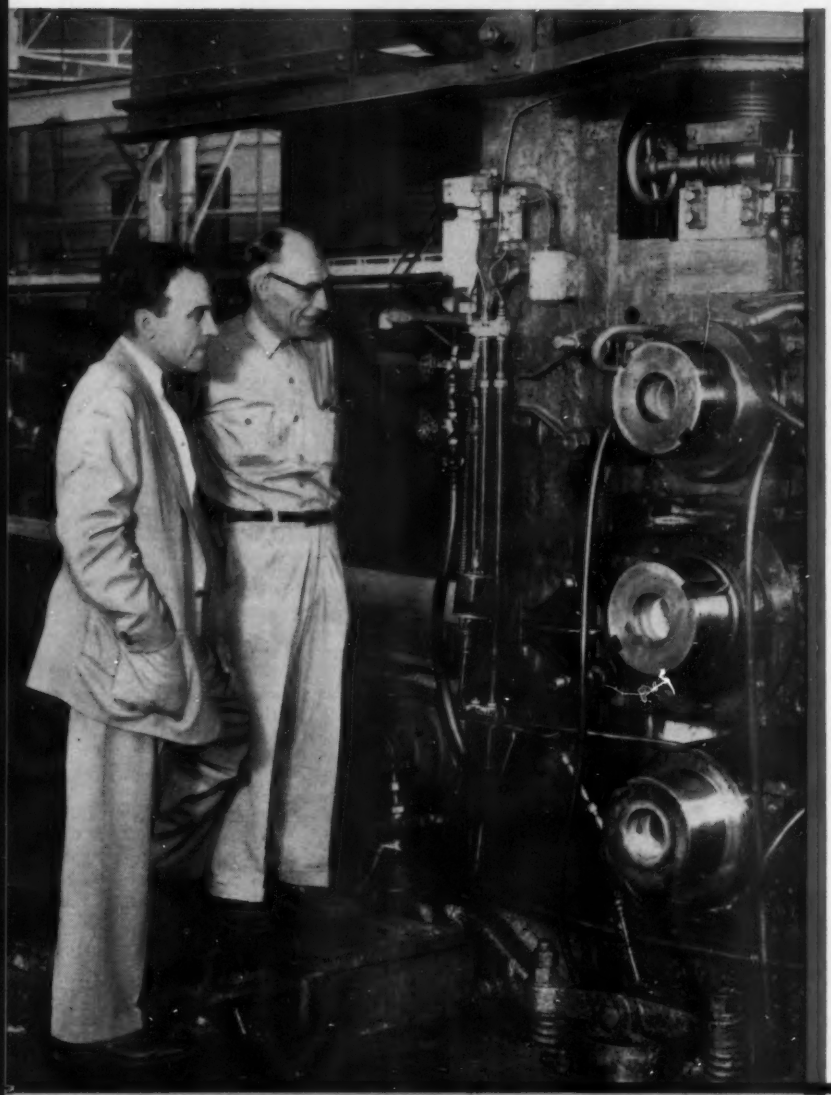
Riverton, Va.—Riverton Lime & Stone Company, is considering plans for the construction of a Portland cement plant on local site. Plans call for the erection of cement mill with an annual capacity of 1,500,000 bbl of cement.

Milwaukee, Wis.—A. O. Smith Corp., steel products, 3533 N. 27th St., has announced plans for major improvements and expansion of company's manufacturing facilities over the next four years at a reported cost in excess of $50,000,000. Included in the program are the construction of new East and West Coast heating and air conditioning equipment plants; expansion of press facilities in the Milwaukee auto frame plant; replacement of facilities at Los Angeles, Calif. for production of pumps and meters; and general renovation of other company facilities. Sites for proposed heating and cooling plants were not disclosed.

Milwaukee, Wis.—AC Spark Plug Division of General Motors Corp., General Motors Building, Detroit, Mich. has authorized plans for the construction of new manufacturing plant. Building of 75,000 sq ft of floor area will be built on 160 acre tract of land in Oak Creek Township, south of William Mitchell airport. Several other buildings will be added later.

Wauwatosa, Milwaukee, Wis. — The General Merchandise Company, wholesale mail order firm has approved plans for the construction of a one story structure of 500,000 sq ft to be erected on 33 acre site acquired for the purpose. Cost to be $4,000,000.

Sick slab roll recovers fast with application of STANOGEAR *Compound*



Eugene Ewald (right), Mill Foreman, and Marshall Fox, Standard Oil lubrication specialist, inspect slab roll. STANOGEAR Compound helped solve lubrication problem on roll neck bearings.

Marshall Fox who proposed switch to STANOGEAR with resultant improved operation, is experienced in providing such technical service. Marsh has a Mechanical Engineering degree from Purdue to qualify him for this work. In addition, he has completed Standard's course for sales engineers. This experience and training, customers find, pay off *for them.*

A slab roll at Matthiessen & Hegeler Zinc Company, La Salle, Illinois, was sick. It suffered from repeated roll neck bearing failures. Bearing temperatures couldn't be controlled. A consultant was summoned—Marshall J. Fox, Standard Oil lubrication specialist. His diagnosis and remedy: Install STANOGEAR Compound and equip the machine with a central pressure system for application. Recommendations were followed. Result: No bearing failures, due to faulty lubrication, since. Maintenance costs reduced. Time lost through breakdowns slashed.

This was a condition made to order for STANOGEAR to remedy. And Matthiessen & Hegeler knew there was a man at hand who could suggest what should be done. It's another demonstration of what this unbeatable combination can do when put to work:

1 **Standard Oil lubrication specialists capable of giving technical help.**

2 **Top quality products *that deliver results required.***

STANOGEAR Compounds contain special additives making them suitable for applications where heavy loads cause welding, seizure or scoring.

In the Midwest and Rocky Mountain states, a Standard Oil lubrication specialist in your nearby Standard Oil office will gladly give you more information about STANOGEAR. Call him. Or contact Standard Oil Company, 910 So. Michigan Avenue, Chicago 80, Ill.

STANDARD

STANDARD OIL COMPANY

(Indiana)

For more facts circle 576 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

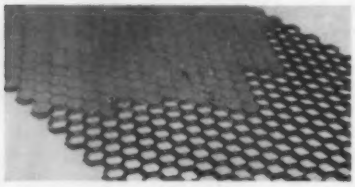
Edited by M. E. Heniken

1—PLATE BATTERIES for motive power uses

Exide Powerclad Batteries are described as premium flat-plate batteries with triple insulation, available at lower first cost. They are intended for use in electric industrial trucks and similar applications. Powerclad positive plate grids are constructed of Silvium, a corrosion-resistant alloy. Vitrex and perforated polyvinyl chloride retainers, wrapped and fastened, a polyethylene insulating strip and a deeply grooved microporous rubber separator are used to achieve positive plate insulation. Exide Industrial Div., The Electric Storage Battery Co.

2—STEEL ARMOR for low cost floor durability

Floor areas subject to abuse and heavy traffic can be made more durable with Gridsteel, a low cost floor armor, it is announced. Gridsteel is made of steel bars on edge, fastened together in an overall hexagonal pattern. It may be



placed over any type of floor surface or incorporated with new flooring. After the Gridsteel has been laid, its meshes are usually filled with concrete or a mastic. The steel bars take the heavy wear, and the concrete fill cannot develop ruts or potholes, it is pointed out, because cracking or chipping is confined to the small area of a single mesh in which it may occur. Gridsteel is supplied in a bar thickness of 14-gage steel by ¾-in. depth (other depths and gages are available). It is declared easy and simple to install because it is shipped in standard panels, 3 by 10 ft, which can be spliced together to form a continuous armored floor surface. Irving Subway Grating Co., Inc.

Use the Reader Service Cards provided on pages 201-202 to ask for more information on these products. Circle item numbers of products in which you are interested.

4—TEFLON TAPE can be cemented to many surfaces

This Teflon tape is treated for cementing with any commercial adhesive (including pressure sensitive ones) to metal, glass, wood, plastics, or other surfaces. It comes in 5- to 60-mil thicknesses, in continuous rolls up to 12-in. wide; also in 24-by-24 in. sheets, ⅜ in. thick, and 48-by-48 in. wide, ⅛ in. thick. Thin section applications of this material can be made for purposes where Teflon's anti-hesive sanitary surface, chemical inertness, broad service temperature range, and dielectric and other qualities are desired. Suggested uses include frictionless facings for conveyor and packaging machine guide rails; frictionless linings for hoppers and tanks; insulating electric motor windings and electronic coils for high temperature, high voltage, high frequency services. Also, Teflon tape, treated for adhesion on both sides and laminated to another dielectric for rigidity, offers possibilities for printed circuit production. The United States Gasket Co.

5—LIQUID SOAP has high germicidal properties

Staphacide is announced as a concentrated (40 per cent soap with 2 per cent G-11) USP liquid soap especially adapted for use where cutting oils, degreasing compounds and detergents and other chemical compounds may cause dermatitis and other skin conditions. It is made from vegetable oils, and its germicidal properties are claimed to assist in preventing infection in wounds and burns. According to company, the soap does not deteriorate with age. B & W Chemical Co.

3—REEL keeps welding hose put up

Underwriters' Laboratories listing is announced for the Model OA Weldreel. In keeping hose off the floor this twin hose reel offers both safety and good housekeeping advantages, as well as extended hose life. Two universal brackets attach the reel to ceiling, wall, floor, or welding cart, and its roller feeding action is designed to let the hose pay out freely and lock automatically at any desired length. A slight tug releases the locking pawl, and a spring retracts the hose onto the reel. The unit handles up to 50 ft of 3/16 in. dual welding hose and lesser lengths of 1/4- or 5/16-in. dual welding hose. According to manufacturer, the chevron type seals in the rotating swivels tested leakproof up to 600 psi after 50,000 cycles. United Specialty Corp.

6—NUT-RUNNING TOOL is air-operated unit

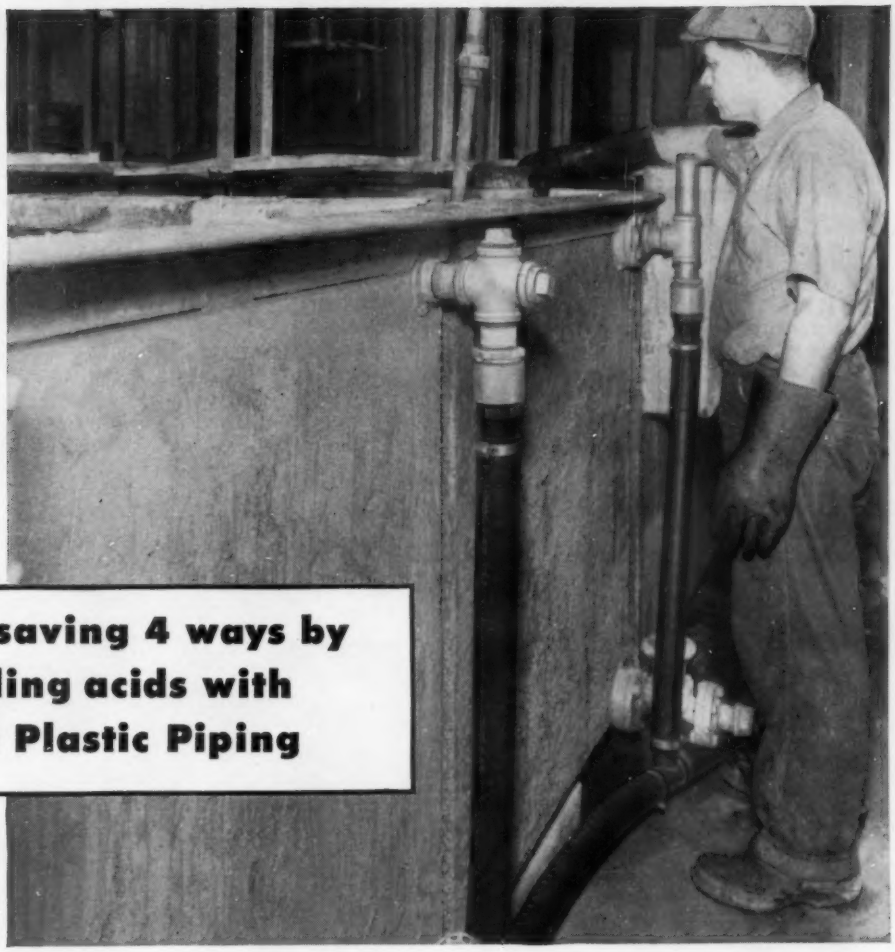
The Torque Control Impactool is announced as an air-operated nut-running tool which impacts the nut to a desired preset torque for precision tightness, then automatically shuts itself off. Manufacturer calls it the first application of the torsion bar principle to torque control. It is believed that the tool will speed bolting of steel construction and make it less costly. In place of a four-man riveting team, the tool needs only one man to run the tool and another to hold the bolt. No training is necessary to run down bolts or nuts with the Torque Control Impactool, says company, and testing for proper tension isn't required.

Action of the mechanism is likened to that of a pogo stick, which bounces evenly on soft ground, but suddenly rebounds higher when it strikes a hard surface. While the nut is being run to the required torque, the tool operates at normal power and speed, but when required torque is reached and nut running mechanism is equal to the stress preset in the torsion bar, the impact mechanism rebounds and trips a rubber-faced shutoff valve. Among advantages claimed for the Torque Control Impactool are: torque setting is simple and remains constant; torque control is consistently accurate; operation is reversible; it runs nuts fast; pressure regulators are not required; maintenance is low. Ingersoll-Rand Co.

7—TEMPLATE KIT for faster layouts and drawings

For drawing general layouts of details of any valving and piping system in a fraction of the usual time, this matched set of five vinyl templates contains American Standard symbols, has provisions for new or special symbols, and is claimed to be the most complete of diagramming outfits for such work. Some 5000 commonly used pipe, fitting and valve diagrams can be pencil drawn by using the cut out symbols on the templates singly or in combinations. Layouts made with them can be used for fluid or gaseous processes — pipelining, refining, pumping, heating, refrigeration, steam, high pressure, others.

The kit of four 5⅛ by 9⅞ pipe, fit-



They're saving 4 ways by handling acids with Crane Plastic Piping

THE CASE HISTORY— Globe-Union Inc., leading storage battery builder, in its Milwaukee plant, might have decided plastic piping wasn't for them and let it go at that. Instead, they gave Crane plastic products a fair trial, and here are the results.

On hydrochloric acid lines to zinc-plating tanks, the metal pipe and fittings formerly used had to be replaced completely about every month. Corrosion was the cause.

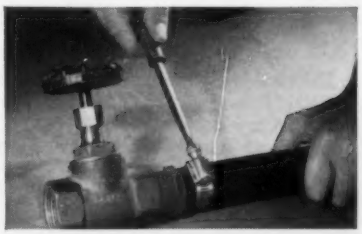
With Crane polyethylene pipe and Crane plastic fittings in this same service, after more than 3 months there is no sign of deterioration and no apparent need of early replacement.

On battery test tanks, Crane plastic piping, exposed to built-up sulphuric acid concentration, looks good as new after more than 4 months' service.

Savings with Crane plastic piping are adding up 4 ways. Plastic cancels the need for costlier metal pipe. It is installed in a fraction of the time it takes for metal pipe and fittings. It reduces installation to a one-man job with simple hand tools. The longer life of plastic is saving replacement, maintenance and housekeeping costs.

Proved in severest services, Crane plastic piping is giving Globe-Union equal satisfaction on many low-pressure air and water lines. Here freedom from sweating is another advantage of plastic.

Once you know the facts of quality-designed, quality-made Crane polyethylene pipe and Crane plastic insert fittings, you, too, will see many opportunities for saving with this modern piping. Call your local Crane Representative today, or write to address below.



Crane adapter makes plastic-to-metal joints easy

CRANE PLASTIC PIPING

VALVES • FITTINGS • PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

For more facts circle 578 on Reply Card

3 New Norgren Air Line Filters
REDUCE WEAR ON AIR-POWERED EQUIPMENT

New Sizes of Automatic-Drain Filters Added to Norgren Line

Automatic-drain filters for use with ¼" and 1" air lines are now being manufactured by Norgren in addition to their present models for use with ¼", ⅜" and ½" air lines. Three filter elements are available—of 74, 64, and 25 microns.

Norgren Automatic-Drain Air Line Filters filter oil, corrosive moisture, abrasive pipe scale, rust and other solids from compressed air. A float controlled, pilot operated drain mechanism, operating under constant or fluctuating line pressures with or without air flow, automatically drains collected liquids. For trouble-free operation and reduced wear, the solids are prevented from entering the drain mechanism.

Series 11,200
¼", ⅜", ½", ¾", 1"
Pipe Sizes

New Metal Bowl Filter for higher temperatures and pressures

A new model replaceable metal bowl air line filter has been added to the Norgren line. The metal bowl allows the filter to be used at temperatures from —40° to 300° F. and at pressures ranging up to 250 psi.

These filters are designed to create a strong centrifugal force that "wrings" a high percentage of moisture and oil from the air. A baffle traps liquids and solids in the Quiet Zone in the bottom of the bowl and prevents them from re-entering the air line. Three filter elements are available—of 74, 64, and 25 microns.

Series 12,200N
¼", ⅜" Pipe Sizes

New, Better, Low Cost Filter

Norgren is now manufacturing a new, low cost filter for applications where the removal of solids from the air is of primary importance. The replaceable bowl can easily be removed for cleaning or it can quickly be replaced if accidently damaged in use.

The filter part of the unit, a reinforced 200 mesh Monel wire screen or sintered metal filters of 64 and 25 microns, is easily removed for cleaning without removing the entire unit from the air line. There are no moving parts to wear out and the filter functions with a minimum of pressure drop.

Series 30AD
¼", ⅜" Pipe Sizes

There is a Norgren AIR LINE FILTER for every air line need.

C.A. Norgren CO.

3443 So. Elati, Englewood, Colo.

For complete information about Norgren Air Line Filters, phone your nearby Norgren Representative listed in your telephone directory—or WRITE FOR NEW No. 700 CATALOG.

PRESSURE REGULATORS • AIR LINE FILTERS • LUBRICATORS • AIR CONTROL VALVES

For more facts circle 579 on Reply Card

NEW PRODUCTS

(Begins on page 138)

ting, and valve indication templates, and one dimensioning template costs less than $14.00. Or the larger four templates may be ordered individually. A. Lawrence Karp.

8—PACKAGED BOILER for use in limited space

Model N50, a packaged boiler designed to handle up to 50 hp, is small in size for use where space is limited. It measures 7-ft 2-in. long, 3-ft 4-in. wide and 5-ft 2-in. high. Clearance of less than 4 ft from both front and rear doors is all that is required for tube removal. A fully assembled unit, the boiler is equipped with burner, boiler trim, automatic controls, fiber glass insulation and metal jacket. It can be furnished to burn light oil, No. 5 oil or gas. Units for burning either gas or No. 5 oil or lighter can also be supplied. Burner is a forced-draft type; it fires directly into the water-backed furnace. Boiler Engineering & Supply Co., Inc.

9—CONVEYOR BELT, of heat resistant rubber

Solarflex Conveyor Belts are claimed to outlast many "hot material" belts by as much as three to one. They are constructed of a man-made rubber noted for

resistance to the effects of heat, says manufacturer, and field tests show that it remains pliable and elastic even when exposed for long periods to materials at temperatures to 350 F. The construction of these belts is also said to permit more efficient service from mechanical belt splices. Belts come in a choice of fabric reinforcement which includes glass fabric, rayon-nylon, rayon, cotton-nylon and cotton. The B. F. Goodrich Co.

10—FLOOR DRILLS are stationary head type

Shipped with motor and controls, and ready to operate, these 21-in. drills are supplied with power feed as standard equipment in addition to the hand lever and hand wheel feeds. Electrical controls are built into the head. A selector is used to obtain any of four rates of feed. A depth gage, incorporating a positive

Reduces Pipe Handling Time by 83%

Savings Pay for Tramrail System in One Year

▲ The Tramrail transfer crane travels in the middle bay and connects as desired with the spur tracks over the side bays, thus enables the hoist carrier reaching every part of the room. Incoming pipe is lifted from railroad cars with a Cleveland Tramrail hoist carrier operating on a track serving the floor above and lowered through the hatchway at one end of this warehouse.

◀ Outgoing pipe is brought directly from storage to trucks. The hoist and entire system is rated at one ton.

SEVERAL hundred tons of ⅛ to 16 inch diameter pipe are received at the Pipe Warehouse of Palmer Supply Co., Seattle, Washington, per month. To handle this by hand was such a loathsome chore that it was difficult to keep men at this work, and the labor turnover was large.

The installation of a Cleveland Tramrail track and transfer crane system took over the fatiguing job of lifting, as well as hauling, of the pipe into and out of the warehouse. It made possible the handling of large, heavy bundles per trip in less time than required for one or a very few pipes by manual handling. It thereby reduced the man-hours required for pipe handling to approximately one-sixth. Resulting dollar savings paid for the system in one year.

Cleveland Tramrail equipment offers you so much and pays off in so many ways for such a long time that we urge you to study its possibilities in your plant.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

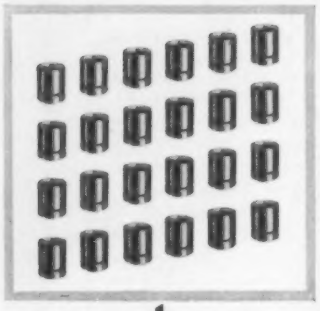
CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
7507 East 290th St., Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

For more facts circle 580 on Reply Card

got a tool problem?

LOOK HOW Snap-on TOOL SPECIALISTS CUT SOCKET BREAKAGE 20-FOLD FOR INDUSTRIAL FIRM



R. J. RIPPLE

problem:

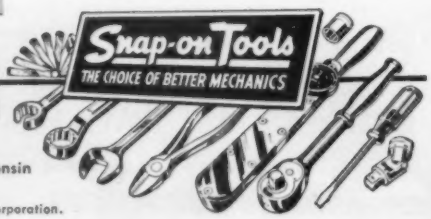
A large Milwaukee industrial concern was breaking an average of a socket per day on nut-running jobs handled with high-cycle nut runner. This not only meant tool replacement expense, but even more important, a loss in production time.

solution:

The problem was turned over to a *Snap-on* tool sales engineer, R. J. Ripple, who went over it in detail with his factory laboratory experts. They found that the socket used was not designed to handle the type of work involved. A new, special heat-treated socket was developed to meet the job requirements. Now socket breakage is less than one a month, lost time is negligible.

WHAT IS YOUR PROBLEM?

If you have a production or maintenance problem involving special tool design or application, or any other question on tools, talk it over with your *Snap-on* man. He is a specialist who devotes all his time to industrial application of *Snap-on* tools. Write us or call your nearest *Snap-on* branch. Free catalog of industrial wrenches and hand tools is yours for the asking.



SNAP-ON TOOLS CORPORATION
8068-C 28th Avenue, Kenosha, Wisconsin

*Snap-on is the trademark of Snap-on Tools Corporation.

For more facts circle 581 on Reply Card

NEW PRODUCTS

(Begins on page 138)

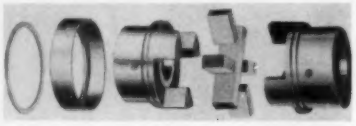
stop, is provided to disengage feed automatically. The No. 4 Morse taper spindle is mounted in heavy duty ball bearings. Eight spindle speeds are provided, ranging from 23 to 400 rpm. No wrenches are required to change spindle speeds, it is noted, and both hands are free to shift the V-belt to position. A full belt guard is provided. Drills are rated at 1½ in. in cast iron with a 1-hp 1800 rpm motor. Cincinnati Lathe and Tool Co.

11—NYLON CEMENT in wide viscosity range

Nylosil is announced as a nylon cement requiring no curing and available in a wide range of viscosities. It is said to achieve joints possessing all the strength and inherent characteristics of nylon, and to have high resistance to oils, aromatics, aliphatic solvents, fruit acids, alkalies and bleaches. Tests are reported to show that Nylosil bonds are effective under wide temperature ranges. A feature claimed for this adhesive is ability to fill in gaps that result when surfaces to be jointed are not matched. Ions Exchange Corp.

12—FLEXIBLE COUPLING is easy to assemble

This radially removable flexible coupling, the C-R, is claimed to offer extremely easy assembly and disassembly, to be lubrication-free and especially suited to centrifugal and impeller pumps.



Six sizes are available, ranging from 2.58 to 29.6 hp at 100 rpm. All have cushions which can be reversed on unidirectional loads to double their service life. Radial removability is accomplished by special cushions cut so they are held in position by a standard Type C collar when the coupling is assembled. When the collar is removed the cushions can be easily removed. This allows the coupling half and connected shaft to be rotated so the intermeshing jaws slide into the stationary coupling half which is not removed, it is explained. Lovejoy Flexible Coupling Co.

13—PVC PIPE, FITTINGS handle corrosive fluids

Described as an economical solution to many process piping problems, this line of polyvinyl chloride pipe and fittings is designed for conveying of corrosive fluids at moderate temperatures (to 140 F). working pressures to 125 psi at room temperature. Advantages announced include low initial cost, low maintenance costs and reasonable life expectancy. The material is an opaque gray-pigmented

POWER of a giant

. . . but a PYGMY in size!

MERCURY "BANTY"

Model 460, 4-Wheel Gas Tractor

With a turning radius of only 62½" and overall dimensions of 78¾"x41"x 56½", the MERCURY "Banty" is the most versatile . . . maneuverable . . . and dependable tractor made. Typical of the important economies possible with this unusual machine is the experience of one large company that moves over 4,000,000 lbs. per day with a "Banty" and train of trailers at a cost of less than 6c per ton.

Model 460 "Banty" is available in two models for regular or LPG operation— Standard 2400 lbs. or Heavy Duty 3000 lbs. D.B.P. Request Bulletins T-101 and T-102.

If you are moving large volumes of materials over long distances it will pay you to investigate the handling economies of the MERCURY "Banty" and the "Trackless Train" system.

MERCURY A-310 TRAILER
Burden carrier of the "Trackless Train"

MERCURY
MANUFACTURING COMPANY
4002 S. Halsted St., Chicago 9, Ill.

MERCURY
FORK TRUCKS · TRACTORS · TRAILERS

For more facts circle 582 on Reply Card

"Now is the time to prepare for next and future winters."

"Maybe your production has never been stopped by a gas curtailment. But companies like yours lose thousands of dollars every year during cold weather because of interruptible fuel contracts. You know how much even a one-day shutdown could cost your plant. Can you afford to risk such production losses?

"Now is the time to install a standby Skellyfuel LP-Gas system that can give you positive protection against interruptible gas contract fuel curtailment. Many companies report their Skellyfuel installations have paid for themselves with the savings from as little as a few days use.

"No adjustment to your present gas combustion equipment is required with a custom-designed Skellyfuel system. When curtailment hits, you can switch over to Skellyfuel instantly. And because Skellyfuel has pioneered in commercial LP-Gas research and quality-control for over 25 years, you can be sure that Skellyfuel is pure, moisture-free, and clean-burning.

"You can forget installation worries, too, when Skellyfuel construction engineers take over the installation of your propane-butane system. Skellyfuel's Industrial Service assumes all responsibility—from survey and plans to actual construction. And Skellyfuel engineers completely train your personnel in the operation of the equipment.

"Why not look into the low cost of a Skellyfuel standby or prime fuel supply installation for your plant? The complete story of Skellyfuel's high quality, dependable service and superior installations is yours for the asking. Just write for our free 20-page color booklet."

SKELLY

Skellyfuel

SKELLY OIL COMPANY
Industrial Division
605 West 47th Street
Kansas City 41, Missouri

For more facts circle 583 on Reply Card

NEW PRODUCTS

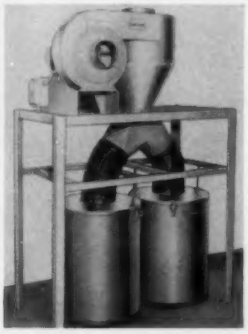
(Begins on page 138)

thermoplastic. Rigid, unplasticized pipe will be available in 10-ft or custom 20-ft lengths of American Standard Schedule 80 threaded pipe, ½ to 4 in. ID.

The pipe can be cut, sawed and threaded with conventional pipe tools, or bent into different shapes after oven heating. It is light in weight—a 100-ft length of 1-in. pipe weighs 40 lb. Bulletin PE-40 gives data. Corning Glass Works.

14—DUST COLLECTOR for outside air exhaust

The 11NW50 Dustkop Dust Collector, designed for use where outside expulsion of cleaned air is necessary, where application of recirculating air collectors is not practicable or is prohibited, is also adaptable for use at installations where



toxic fumes, obnoxious odors or smoke, as well as dust, accompany the operation for which collector is used. Collector does not remove fume or odors from the air but merely exhausts it out of doors through a pipe connected to outlet collar at top of cyclone separator.

The unit has a large capacity — up to 64-gal. It is built with framework of welded angle iron and dust drums of reinforced sheet metal. Unloading maintenance is simplified by virtue of a wire reinforced Neoprene flexible hose which connects to the rubber castered storage cans individually, and to collector by a diverting "Y" to divert flow of dust to one can while the other is removed for dumping. Aget Mfg. Co.

15—PLATING PROCESS needs no bright dips

For bright cadmium plating in still tanks, the Cadalume Process is introduced as a simple-to-operate low-cost bath for producing bright, uniform cadmium deposits. Cadalume makes bright dips unecessary, it is noted, although it will take conversion coatings. The Cadalume brightener may be added directly to the bath, says company; and the brightness appears immediately in a balanced bath. The process is used to protect iron and steel parts against corrosion, and non-ferrous metals against

You're covered across the board

when you use
General Controls' line of quality automatic controls

In heating, power generation or process regulation – whenever automatic controls are needed – plant engineers everywhere have found that it pays to check *first* with General Controls. General Controls' comprehensive line ranges from the simplest time switch or thermostat to advanced programmers and recording controllers. And you're never very far from one of 40 helpful branches (located coast to coast), where General Controls' experienced representatives are always at your service. Give your local General Controls field representative a call on your next control problem.

K-21 MAGNETIC STOP VALVE

Packless – 2 way – normally closed. For air, gas, steam, water, oil, corrosive fluids. Pressures to 300 psi. Forged brass body. Stainless steel or soft seat.

K-27 MAGNETIC VALVE

Stainless steel for high sulphur fuels, syrups, juices, acids, alkalis, etc. Pressures to 300 psi. Midget size. Multi poised – operates in any position.

K-10 MAGNETIC VALVE

Lever action for higher seating pressure. Excellent general purpose valve for primary fuel, feed water, steam, air. (300 psi max. operating pressure differential.)

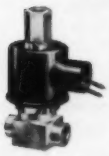
K-15 MAGNETIC VALVE

Piloted piston design. Large flow capacity with low pressure drop. For air, gas, steam, oil derivatives. Versatile – with 3 coil classes, 5 seat variations.

K-123 MAGNETIC VALVE

3 way – for normally open or normally closed directional control and mixer applications – on pneumatic or hydraulic operated devices, machine tools, etc.

K-273 MAGNETIC VALVE



3 way flow or mixer type. Compact, multi poised. For air, water, hydraulic fluids – charging or emptying systems. Normally open or closed. Choice of flow patterns.

TIME SWITCHES

Wide selection for domestic and commercial use – spring wound or motor driven, normally open or closed. For ventilating, lighting, refrigeration, etc.

HYDRAMOTORS

Wide range of types in complete range of pipe sizes and body styles to provide safe, dependable, durable answer to all liquid transfer problems.

AIR MOTOR VALVES

Air-operated diaphragm valve for modulating control. Normally open or closed, 3 way, or slide gates. Selection of various inner valves, body sizes and connections.

General Controls
Automatic
Control Line

Five Plants:
Iron Mountain, Michigan
Glendale, California
Burbank, California
Skokie, Illinois
Guelph, Canada

GENERAL CONTROLS

Manufacturers of Automatic Controls for Home, Industry, and the Military

FORTY BRANCH OFFICES SERVING THE UNITED STATES AND CANADA

PERFEX CONTROLS AND GENERAL CONTROLS

For more facts circle 584 on Reply Card

Single-stage and compound R-C Vacuum Pumps in a southern mill.

R-C *plur-ability* PAYS OFF IN VACUUM PUMP PERFORMANCE

For moving gas or air, call on R-C plur-ability

Centrifugal and Rotary Positive Blowers, Gas Pumps and Exhausters

• • •

Spiraxial® Compressors

• • •

Positive Displacement Vacuum Pumps and Meters

• • •

Inert Gas Generators

• • •

Send for details and informative bulletins.

Important operating factors, which add up to *R-C plur-ability*, account for the rapidly increasing use of Roots-Connersville Positive Displacement Vacuum Pumps for industrial processing.

- **Reduced horsepower at higher speeds** (600 rpm and up) creates power savings up to 25% and far lower first cost of motors.
- **Single-stage or multi-stage units** in size ranges for all requirements.
- **Long-time reliability and low maintenance** no internal contacts or excessive wear. Almost complete freedom from down-time and maintenance.
- **Small floor space** less expensive foundations. Lower cost per cubic foot of capacity. Adaptable to crowded space.
- **Minimum sealing water** from 4 gpm. to 40 gpm. Efficiencies not affected by changes in water temperature.

To see how leading industrial users make a profit from *R-C plur-ability*, write for details, in Bulletin 50-B-13.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

356 Power Avenue, Connersville, Indiana. In Canada — 629 Adelaide St. W, Toronto, Ont.

For more facts circle 585 on Reply Card

NEW PRODUCTS

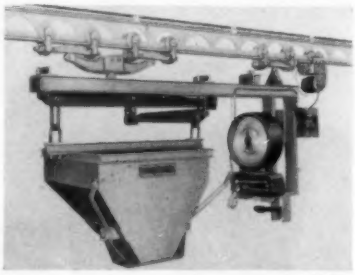
(Begins on page 138)

surface tarnish, corrosion or galvanic couples formed in assemblies.

It is explained that although the Cadalume deposit has exceptional brightness as deposited, on deeply recessed work, a 1 per cent nitric acid bright dip may be used to brighten low current density areas. Both cost and rate of consumption are reported low, since a single liquid brightener is used in a standard cadmium solution. The process is claimed to increase plating speeds, improve deposit distribution and throwing power, and produce heavy deposits, where required, without loss of brilliance or formation of surface defects. Hanson-Van Winkle-Munning Co.

16—TRAVELING HOPPER with scale; tractor driven

For handling pottery clay or other bulk materials, the hopper of this unit is of 1 cu yd capacity. It is so located with respect to the track on which it travels



that a large opening is provided at top for filling The hopper is emptied by a bottom gate which can be manipulated from both sides of the bucket. A 5000-lb dial scale with tare beam weighs ingredients as they are gathered from overhead storage bins. Spring clip markers are provided on the scale to facilitate quick weighing when similar batches are made up repeatedly. The supporting load bar rides on 12 ball-bearing wheels, and the unit is propelled by a tractor drive at 150 fpm. Push-button control is automatic accelerating. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

17—PRESSURE GAGE works in high temperatures

Model C Pressure Gage is described as capable of giving continuous and accurate readings under prolonged exposure to high temperature and radiation. Available in standard and special pressure ranges, it is designed for a-c operation, 60 to 400 cycles in continuous radiation flux of one million Roentgens per hour. The gage may be installed on any pipe or vessel for use with high temperature liquids or gases, and the pressure-sensing bellows may be various materials.

The instrument consists of the bellows, a differential transformer and a meter to

Save maintenance dollars—*modernize* your worn-out windows with PC Glass Blocks

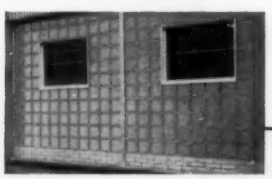
When window sash starts to go, the next step is an "either-or" decision—*either* repair it *or* remove the cause of the trouble.

The discouraging thing about a repair job is that you are only buying temporary relief—not a permanent cure. What you repair is still exposed to the same threats that caused the rusting, rotting and buckling in the first place. So your maintenance dollars are pretty much wasted.

It's an entirely different story when you *remove* the cause of the trouble. And that's where PC Glass Blocks can help you. You see *why* in the main illustration. Take a good, hard look. The worn-out sash has been removed, and glass blocks are being *mortared* into panels. Notice there's nothing to rot, rust or buckle. The result—window areas that are breakage-resistant and maintenance-free.

This is only part of the glass block benefit story. No dirt infiltration, high insulation value, ease of cleaning, better daylighting, and an improved exterior appearance figure in, too.

If the windows in your plant are at that "either-or" stage, you'll find it profitable to get the facts on PC Glass Blocks. For more information, see us in Sweet's, or write for our booklet on window modernization. Pittsburgh Corning Corporation, Dept. PG-36, One Gateway Center, Pittsburgh 22, Pa. In Canada: 57 Bloor Street West, Toronto, Ontario.



PC Glass Blocks mean better light inside—better looks outside

PC Glass Blocks

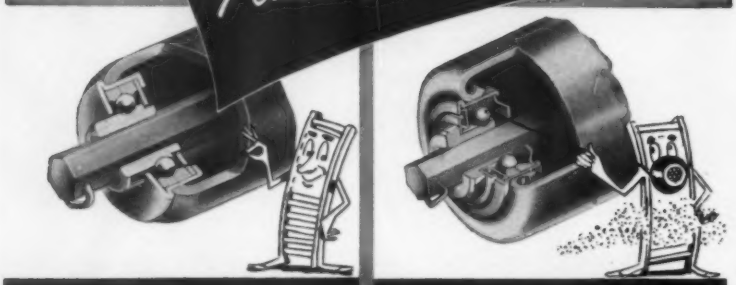
PITTSBURGH PC CORNING ®

Also manufacturers of FOAMGLAS® insulation

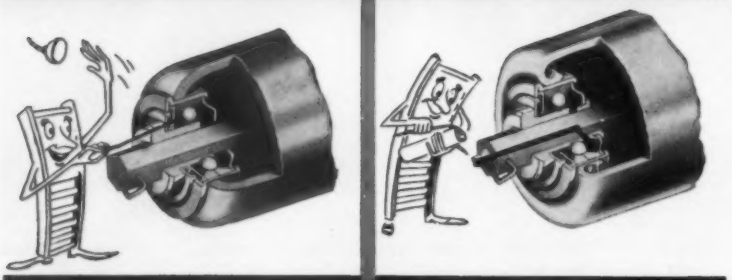
For more facts circle 586 on Reply Card

Better Built

BUSCHMAN ROLLER CONVEYORS Feature:



Plain Ball Non-Lubricated Bearings | Dustproof Labyrinth-Sealed Bearings



Grease-Packed-For-Life Bearings | or Pressure Lubricated Bearings

TO MEET YOUR REQUIREMENTS

In roller conveyors, it's the bearing that counts! And BUSCHMAN conveyors use only performance-proven bearings... engineered for long life and trouble-free operation in every type of service. No matter what normal operating conditions may be, BUSCHMAN has a conveyor pre-engineered to meet your needs.

Conveyors are available with various types of rollers and frames, in different sizes and spacings, and in any width from 6 inches on up. BUSCHMAN can supply 45° and 90° curved sections, switches, spurs, work stations and other components to provide a complete, efficient materials handling system.

For Complete Details, Write For 16-page Catalog No. 60 Today.

PRODUCE MORE ... FOR LESS on Buschman Conveyors

C-113-Ewe

THE E. W. BUSCHMAN COMPANY
4426 Clifton Ave. • Cincinnati 32, Ohio

COMPLETE CONVEYOR SYSTEMS FOR ALL TYPES OF INDUSTRIES • ENGINEERED • MANUFACTURED • INSTALLED

For more facts circle 587 on Reply Card

NEW PRODUCTS

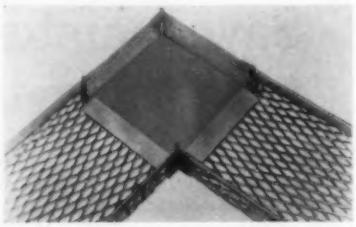
(Begins on page 138)

indicate variations in transformer output. Bellows and transformer constitute one compact unit connected by cable to the receiver—either a direct-reading or a recording meter. The gage measures changes in electrical output in the secondary of the differential caused by movement of the core, which is linked to the bellows. Any change in pressure on the bellows causes a directly proportional movement of the core which, in turn, induces a variation in the transformer output. The gage is not temperature sensitive, it is noted, and the bellows, located just below the transformer, also acts as secondary seal. Bulletin PG-2 gives data. Callery Chemical Co.

Reader Service Cards on pages 201-202 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

18—COUPLING speeds cable trough installation

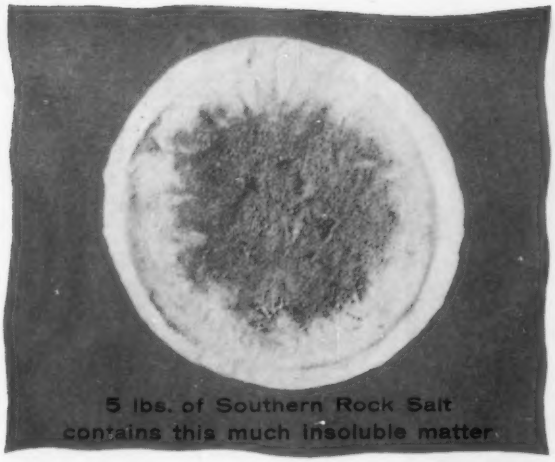
Assembly of cable trough is declared much quicker with the Pin-Type Coupler. This connector secures the two coupler blanks with a simple pin that drops into place. With it, the number



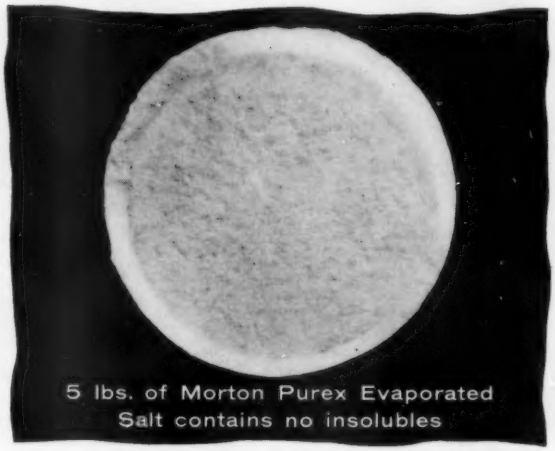
of pieces required for one connection is reduced to three—nuts, bolts and washers are replaced by two pins. The joint is completed with a plate that fits both over and under the bottom of the trough to protect the cable. The pin can readily be removed should future changes or expansions be needed. T. J. Cope, Inc.

19—PORTABLE DOLLY for drums, other cartons

Although designed for use with company's basic barrel vapor degreaser, the Aircon Portable Dolly accommodates any standard 55-gal drum, or may be used to transport other cartons of suitable base dimensions. Its design permits the legs to fold together compactly for easy carrying and minimum storage space. The dolly is constructed so that three legs, made of ¼-in. steel plates, are spaced 120-deg around a circular steel plate and



All filter pads shown, approximately ⅓ actual size. Tests for insolubles were taken from random samples.



Morton Purex Salt is the only one that contains no costly insolubles

When you buy Morton Purex Salt, you get high purity evaporated salt that is made in a controlled-particle size to prevent packing and channeling. None of your freight bill or purchase price goes toward paying for shale and sulphates . . . insolubles like those shown on three of the filter pads above. (And the cost can be considerable. In every 100 lbs. of any of the types of rock salt shown above, you are paying for up to 5 lbs. of insolubles.)

With Purex, no time or labor is spent cleaning out insoluble matter from your brine making system to keep it functioning at peak capacity. For Purex is 100% soluble. Morton Purex will leave no accumulation of material in either the brine or water softener tanks. It can be used in bulk wet storage systems and in the Morton Model E Brinemaker.

For more information about Morton Purex Salt or for free, expert help on any water softening or brine making problem, write or wire:

MORTON SALT COMPANY
INDUSTRIAL DIVISION
Dept. PLE3, 120 So. La Salle Street,
Chicago 3, Illinois

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WHO SAID you can't combine efficiency and ease of maintenance in a dust collector?
EFFICIENT. Turbulent area of water, bubbles and mist assures constant, sustained air water contact.
EASY MAINTENANCE. Dust never comes in contact with dry surface. Sludge is settled, removed automatically. Glass spheres are self-cleaning.

Hydro-Filter offers real simplicity to wet collection problems

Simplicity is the *success* of the National Hydro-Filter and is why it offers constant dust collection efficiency to the micron range *combined* with low operating costs and maintenance that amounts to but *minutes a month!*

Look at the photo—Every inch is *active* space. There is nothing to clog, no baffles to "load up" and reduce efficiency. Water, air and glass spheres do the work and a constant flow of water carries contaminants to the sludge tank where they are automatically ejected.

Sound simple? . . . It is, and the whole story on Hydro-Filter is contained in a comprehensive bulletin that is available on request. Write for your copy today.

Dust Collector Corp.

604 Machinery Hall Bldg.,
Chicago 6, Illinois
Subsidiary of National Engineering Company,
Manufacturer of Simpson Mix-Mullers.

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NEW PRODUCTS

(Begins on page 138)

bolted. Removing one bolt from each of two legs allows them to pivot against the third. A holding lug is welded to each leg to prevent slippage of the drums. Three ball-bearing steel casters allow a maximum of 900-lb capacity, it is stated, depending on weight distribution. When folded for carrying, the unit measures 18 by 12 in.; its carrying weight is 18 lb. It costs around $22.00. Armstrong & White.

20—GLASS FIBER PANES in pre-cut window sizes

Seven stock sizes, conveniently packaged, are now offered in Corrulux, a glass fiber daylighting material now in use for industrial glazing. These pre-cut sizes are available without additional charge. Both Maxlite and skylight green colors may be had in two finishes: smooth on both sides or crinkled on both sides. Corrulux window panes are claimed shatterproof—manufacturer says they can be dropped, stepped on or nailed in place. Corrulux Div., L-O-F Glass Fibers Co.

21—PUMP is canned motor, two-stage type

The 3-hp Series DE (Double-Ended) Chempump is latest addition to company's line of canned motor pumps for handling of corrosive, toxic, explosive,

radio-active and other hard-to-handle liquids. Basically a two-stage pump, pumping chambers can be piped in series or parallel for compact high head or high volume pumping. Overall size of pump is less than 2-by-1-by-1½ ft, yet it gives heads to 230 ft. Pump is available in cast iron, cast steel, 300-series stainless steel, Monel and Carpenter-20. Standard temperature and pressure limits are 450 F and 300 psi. Chempump Corp.

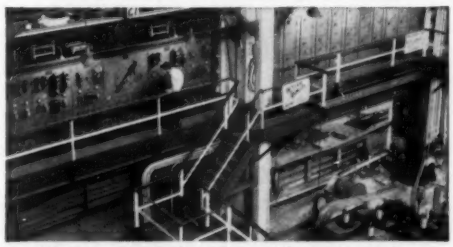
22—POWER UNIT protects against gas pressure

For controlling gas pressure build-up in supply lines, the Series R Reverse Acting Power Unit combined with manufacturer's safety shut-off valve, is claimed to shut off gas supply to burner in case incoming pressure builds up beyond a predetermined safe point. These reverse acting

Vital Functions at the mills of Great Lakes Steel are CLARK CONTROLLED

● Throughout the huge mills of Great Lakes Steel, Detroit, Michigan, Division of National Steel Corporation, vital production and handling operations depend on Clark Control. Illustrated above, for example, is Great Lakes' mammoth stacking conveyor system, linking ship-to-shore unloading and piling of coal and limestone for blast furnaces at Zug Island. Designed and built by Hewitt-Robbins, this travelling stacker—perhaps the largest in the world, handles coal from boats at the rate of 2,500 tons per hour. To maintain production during ice-bound months, it is planned ultimately to stockpile 500,000 tons of limestone and 350,000 tons of coal . . . Clark Bulletin 6080 Reduced Voltage Starters are used on the AC drive motors for this conveyor.

Great Lakes standardized on Clark Bulletin 110 Edgewound Resistors for much of its production and handling equipment, such as this Hot Metal Crane.



Clark Control Panel and Control Center for the hot rolled steel cutting line. Note Clark Edgewound Resistors at top of panel.

The CLARK CONTROLLER Company

Engineered Electrical Control

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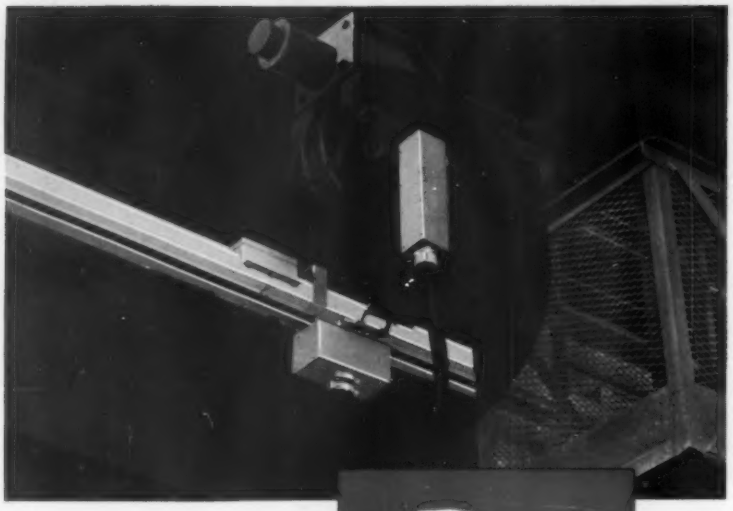
electrification for HEAVY DUTY CRANES and HOISTS



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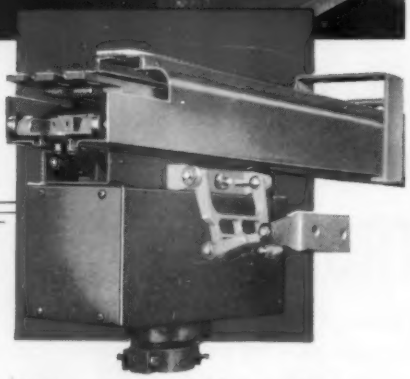
Mooring

POWER SYSTEMS



Why let Crane and Hoist wiring endanger workers or be a potential hazard to your plant? Heavy Duty Feedrail trolley busways give you safe electrification because:

1. **They're a built-for-the-purpose system, designed and constructed expressly for high amperages.**
2. **All current carrying conductors and trolley contacts are protected every inch of the way.**

In addition to maximum safety, Heavy Duty Feedrail fits your requirements. Its standardized components—accurately, ruggedly constructed—make for fast, easy installation. Its low maintenance, long life and continuous dependable service are economy factors in plant operation.

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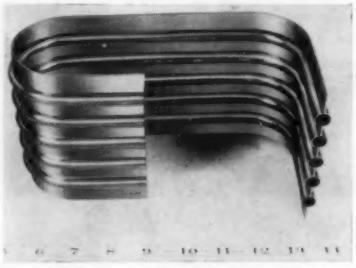
NEW PRODUCTS

(Begins on page 138)

units may be applied to all of company's Lock-Tite Valves, replacing the standard pressure operator. It is also possible to combine reverse-acting power units with standard ones to provide protection against pressure failure as well as excessive pressure build-ups. These units come in four standard tripping pressures ranging to 10 psi. Bulletin M-302-R gives specifications on these valve power units. Eclipse Fuel Engineering Co.

23—TUBE STRIP made of nonferrous metal sheet

Tube-in-Strip comes in a single strip, or sheet, of solid copper, brass or aluminum in which tubes are inflated to desired running lengths in a variety of shapes or sizes. Product is said to have almost limitless applications in the heat exchange field, including refrigeration and air conditioning, chemical, food and petroleum processing, water heaters and coolers, gas heaters, radiant panel heating. Except for expandable portions, metal is a solid strip derived from a suitably treated casting. It can be stamped or drawn into desired shapes prior to expansion of channels. Expanded channels can be made circular in



section, or during expansion metal can be forced into dies producing other than circular sections. (Photo shows it after forming on multiple die hand bends after inflation.) It is also possible to inflate one side only.

Strip is now furnished in long coils or in cut flat sheets in widths up to 16 in. Tube spacing, it is explained, can be as close as ¼ in., and as widely apart as width of metal permits. Inside diameters can vary from about $\frac{1}{8}$ to $\frac{5}{8}$ in., when unexpanded. Tube wall gage can vary from 0.0025 in. to whatever inflation equipment permits. Strip will be shipped uninflated—inflation techniques are described as flexible and simple. It is pointed out that web between tubes conducts heat faster, and that increased structural strength made by inflated channels means lighter gage metals can be used. Revere Copper and Brass Inc.

24—WIRE HOSE for air and water handling

Super-Master BW Air and Super-Master BW Water, high visibility hose of braided wire construction, is designed for extra

NEW PRODUCTS

(Begins on page 138)

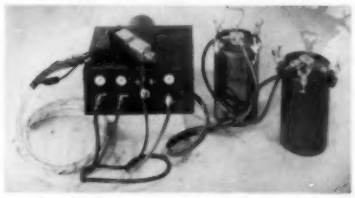
safety at pressures to 2000 psi. Strong enough for air actuating service on the heaviest machinery and loading equipment, yet, company points out, it is light and flexible enough for pneumatic tools. It is built with steel braids that offer maximum resistance to accidental crushing. In addition, it has a Neoprene tube that withstands hot oil from compressors, and a bright yellow cut-resistant cover to provide maximum visibility. Bulletin 7107 gives more details. Manhattan Rubber Div., Raybestos-Manhattan, Inc.

25—TINY CHAIN HOIST can lift up to 250 lb

Weighing only 11 lb, the Midget Chain Hoist is reported capable of lifting 250 lb; it has a standard lift of 7 ft and a minimum distance of 9 in. between hooks, with extra chain available for greater lifts. Company says that a man can easily lift a load 30 ft in one minute with the hoist, which can be used in production applications as well as plant maintenance. According to company the load is held safely by an automatic load brake at all times. Ball bearing trolleys, rated at 250 lb and made to fit all standard 3- to 10-in. I-beams, also are available. Diameter of tread of wheel is 2¼ in. and weight of trolley is only 12-lb. Coffing Hoist Div., Duff-Norton Co.

26—SPRAY GUN for use with epoxy plastic resins

Called the KiPlaGun, this unit incorporates an electrically heated element for maintaining proper spraying temperature, a nozzle that mixes the material just



prior to leaving the gun, and a metering device for proportioning of materials. Savings in costs and time are reported of uses of this gun in combination with company's Kiplakote spray resins and excellent results are said to be obtained as a protective coating for metals and wood. The KiPlaGun is also announced as adaptable to laminating with glass cloth. Kish Industries, Inc.

27—TEMPLATE lets you draw broken line combinations

This template enables a draftsman to draw dot and dash lines with a rapid stroke of a pencil or ball-point pen. Produced for making piping drawings, the template is reported applicable to any type of drawing where various broken-

First Fiberglass Panels Labeled by Underwriters' Laboratories Inc.

RESOLITE'S FIRE-SNUF®

Now you can safely specify translucent fiberglass panels for such installations as skylights, partitions, windows and luminous ceilings—even when building codes call for a flame spread rating of below 75 or where fire-safety is an all-important consideration.

Fire-Snuf fiberglass panels, manufactured by the Resolite Corporation, are listed by Underwriters' Laboratories Inc., and each sheet or pane carries the Underwriters' label. Their flame spread rating of below 75 places them well within the "slow burning" category established by the Building Officials Conference of America.

Flame resistance is chemically locked into the polyester resins from which Fire-Snuf panels are manufactured. They do not support combustion. While they will burn when a hot flame (such as a blowtorch) is applied directly to the surface, they are self-extinguishing and will snuff out as soon as the source of heat and flame is removed.

Fire-Snuf panels are molded in standard building corrugations and flat sheets or panes, in lengths up to 13 feet and widths up to 42 inches. They are available in Fire-Snuf Green, a color which painstaking investigation has proved to be scientifically correct for best working conditions and optimum light diffusion.

Fire-Snuf retains all the best features of standard Resolite panels—shatterproof safety, high strength, translucence, stability and load bearing characteristics.

For additional information consult your nearest Resolite distributor or contact:

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   - knurled bars (Furro-Grip)—for extra safety plus relatively smooth walking surface
   - serrated bars—for maximum safety under extremely hazardous skid conditions
4. no sharp corners to clog—self-cleaning
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6. maximum open area—for light and ventilation

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NEW PRODUCTS

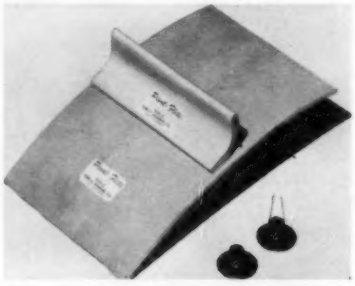
(Begins on page 138)

line combinations are desired. Six different line combinations can be produced; long dash, short dash, long dash and dot, long dash and two dots, short dash and dot, and short dash and two dots. Pencil hardness determines line density. Of transparent plastic, the template is used by placing a straight edge on the desired stencil and drawing the line. It costs less than $1.50, including mailing charge. dot-N-dasher.

To order these bulletins circle item numbers on the handy Reader Service Cards provided on pages 201-202.

28—RUBBER CLEATS stop conveyor belt slippage

Easily attached to any belt by molded rubber rivets, Pivot-Flite Rubber Cleats offer an economical solution to problem of conveying loads up steep inclines. Installation on old or new belts is easy, company points out, can even be done without removing belt from conveyor.

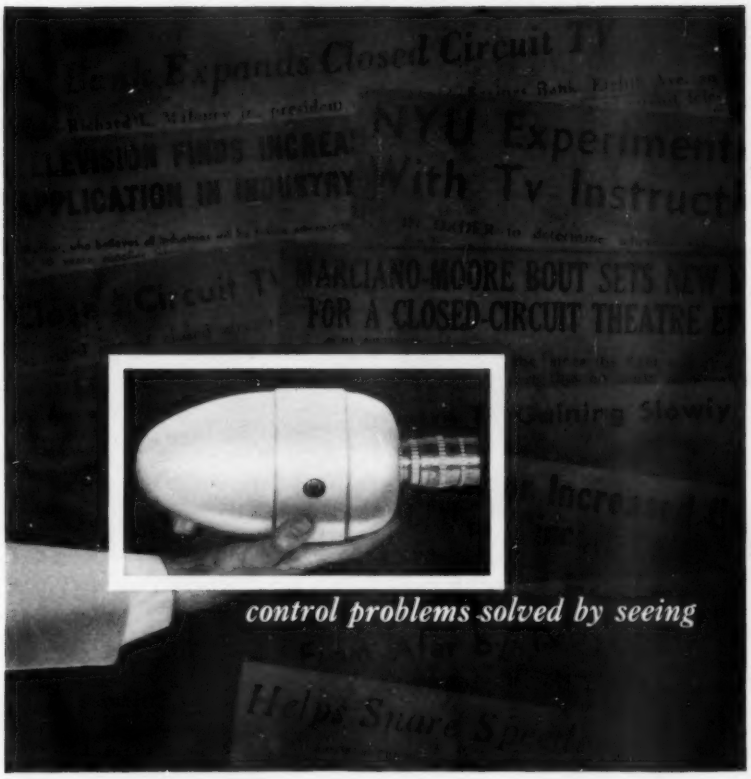


Holes are punched in belt (adhesive-backed templates furnished). Molded rubber rivets are then dunked in adhesive and pulled through holes with pliers; molded shoulders hold rivets in place and seal moisture out of belt plies. Cleat is then attached to rivets with stainless steel hinge pin.

These cleats can be transferred to new belts if desired. All parts are exposed for washing or steam cleaning where sanitation is a factor, and the resilient rubber construction prevents bruising of fruits or vegetables, protects fragile loads. Cleats are available in 1½ by 1½ or 2½ by 2½-in. section dimensions. More details are given in Form PF-1. Holz Tire & Rubber Co.

29—GAGE shows maximum pressure over time period

The Serviceman Maximum Pressure Gage is designed to make constant gage watching unnecessary and to give visual proof of maximum pressure reached over any given period of time. By means of a



GPL ii-TV® is in the news ... is it in your operation?

GPL *ii-TV*, the *industrial* and *institutional* television system of General Precision Laboratory, is an important new control tool for industry—so new that in many fields its applications are just being explored. Already it is evident that it has a multitude of uses in supervision, and in monitoring both processes and machines. No process is too dangerous or too remote, too confined or too dispersed, too monotonous or too fast, for the keen eye of the *ii-TV* camera. And *ii-TV* is proving equally valuable in industrial training and in presenting information to management, in large or small groups.

Behind *ii-TV* are the skill and experience which have made GPL a leading manufacturer of broadcast and military TV equipment. The camera operates unattended, needs minimum light. The entire system is of highest quality, is portable and compact, easy to maintain.

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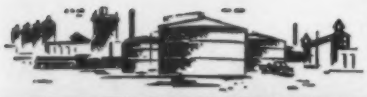

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Wherever a safe footing is required

Grip-Strut circular stairway on Shell Oil tank in Portland, Ore.

See how Shell Oil uses Grip-Strut for a safe ramp between tanks.

View looking down circular stairway on Shell Oil tank shown above.

SAFETY GRIP-STRUT is the new basic material, all in one piece (including channels), not welded, riveted or expanded in steel or aluminum, in standard sizes and gauges. Safety GRIP-STRUT presents an open space, in a diamond pattern, in excess of 55% of the area for ready access of light and air and gives a positive NON-SKID footing in all directions. Ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads.

Important Safety Features

- ★ Fire proof
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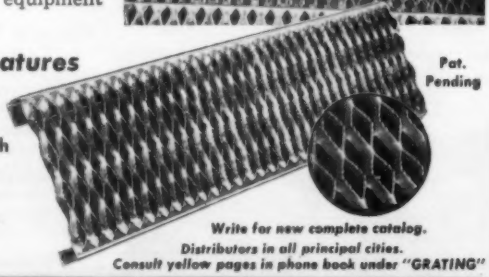

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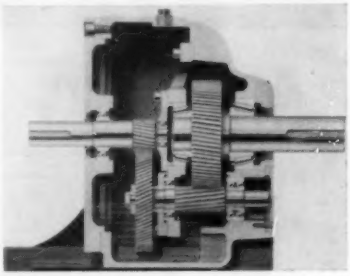
NEW PRODUCTS

(Begins on page 138)

check valve, pressure applied is trapped inside the bourdon tube and the indicating hand is stopped on the dial at the point of maximum pressure. The pointer may be returned to zero by pressing the push button on the gage socket, releasing the pressure. The gage is standard with polished brass case and ring, glass crystal, 2½-in. dial, ⅛-in. male bottom connection and company's recalibrator. Standard dial range is 0 to 400 psi. The gage is suggested for checking cold boxes, balancing refrigeration systems, and checking industrial processes and systems. Marsh Instrument Co.

30—HELICAL DRIVES for heavy duty service

In-line helical gear drives, announced as combining a high degree of standardization with ability to stand up in heavy duty service, include double reduction drives in ratios from 6.2 to 1 through 38.4 to 1, with capacities to 118 hp, and triple reduction units in ratios from 47.1 to 1 through 292 to 1, capacities to 20 hp. These drives have one-piece cast-iron housings, with oil seals at shaft



openings. To minimize space requirements and layout problems, input and output shafts are located in the same horizontal and vertical planes.

Maintenance is simplified through maximum accessibility and the fact that it is not necessary to change the low-gear set in order to alter the ratio. The drives are designed to permit addition of an integral positive-locking backstop without modification. Full information is in Book 2651. Link-Belt Co.

31—SMALL PUMP gives pressures to 10,000 psi

Developed to fill the gap between this company's standard models and hand pumps, the Airhydropump Junior Models can be used in place of hand pumps. They are made in six models with an overall hydraulic pressure range from 100 to 10,000 psi from 100 psi air line; and can be used with water or oil. Manufacturer explains that the air reducing and control valve enables any required hydraulic pressure in the range of the pump to be produced but not exceeded. Once the pump has been set to give the required

Rolling Steel Doors

Manually, Mechanically, or Electrically Operated

MAHON CHAIN-GEAR OPERATOR

MAHON STANDARD POWER OPERATOR 920-P

In the combination truck and railroad opening illustrated below, two Mahon power operated rolling steel doors, with a movable mullion between, solved the problem of an extremely wide opening in which the entire width was required only occasionally for passage of railroad cars. The railroad spur track entered the building at an acute angle which necessitated an opening 36'-9½" wide for required clearance. It was also necessary to have a truck opening 14'-0" wide at the same location—hence the two doors. The 14 ft. door at the left operates normally as an individual door in general service as a truck opening. When it is necessary to use the entire railroad opening, both doors are opened and the movable mullion is unlocked and moved clear to the right on an overhead track. Rolling Steel Doors make ideal closure walls for craneway openings . . . they make economical, space-saving roll-up dividing walls for school gymnasiums . . . they provide an ideal means of controlling ventilation when installed in exterior walls of steel mills, foundries, pumping stations, and booster stations. When you have a special problem, consult Mahon engineers. When you buy a rolling steel door, check specifications carefully . . . you will find many quality and design features in Mahon Rolling Steel Doors that add up to a greater over-all value. See Sweet's Files for complete information including Specifications, or write for Catalog G-56.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago • Representatives in Principal Cities

Manufacturers of Rolling Steel Doors, Grilles, and Automatic Closing Underwriters' Labeled Rolling Steel Fire Doors and Fire Shutters; Insulated Metal Walls and Wall Panels; Steel Roof Decks and Long Span M-Decks; Permanent Floor Forms; and M-Floors (Electrified Cel-Beam Floor Systems).

ROLLING STEEL DOORS, SHUTTERS AND GRILLES TO MEET EVERY REQUIREMENT

Two Mahon Power Operated Rolling Steel Doors, with movable mullion between, installed in a combination truck/railroad opening 36'-9½" x 23'-0" in a new building for the Fitzsimmons Manufacturing Co., Detroit, Mich. Barton-Malow Co., Detroit, Mich., Gen. Contrs.

M A H O N

For more facts circle 596 on Reply Card

MATHEWS Engineers and Builds a complete line of CONVEYING MACHINERY

A typical Mathews Trolley Conveyer installation, helping to create a continuous flow of material through this modern foundry.

WHATEVER your material handling requirements might be, there is equipment in the complete Mathews line to meet them. Whether you need Gravity or Power Conveyers—Roller or Wheel, Belt or Live Roller, Drag Chain or Overhead Trolley, or special conveying machinery—Mathews builds them all, best for you.

50 YEARS OF MC MECHANIZED HANDLING

MATHEWS CONVEYER COMPANY

GENERAL OFFICES . . . ELLWOOD CITY, PENNSYLVANIA

PACIFIC COAST DIV., MATHEWS CONVEYER COMPANY WEST COAST, SAN CARLOS, CALIFORNIA

CANADIAN DIVISION . . . MATHEWS CONVEYER COMPANY, LTD. PORT HOPE, ONTARIO

Engineering Offices or Sales Agencies in Principal American and Canadian Cities. Export Representative—Foreign Trade Division of New York Hanseatic Corp.

MATHEWS

For more facts circle 597 on Reply Card

NEW PRODUCTS

(Begins on page 138)

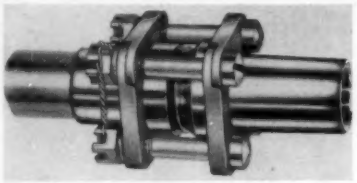
pressure no further adjustment is necessary. On a closed circuit the pump will maintain the pressure for an indefinite period without consuming any air—giving the operator both hands free. It is suggested for pressure testing of valves and small fittings; and as a source of hydraulic power, it is suitable for operating small presses, jacks, rams. It costs around $185. Davies Brothers.

32—VERTICAL DRUM GRAB handles three to six

An automatic device in this grab lets the operator accomplish loading and unloading merely by raising and lowering the hoist line, it is noted. Also, drums need not be specially spaced for this vertical drum grab—only reasonably in line to facilitate placing the grab on the drums for the lift. The grab is designed to handle standard 55-gal drums with uniform shell or body diameter of 22½ in., but grabs for special sizes can be supplied. Downs Crane & Hoist Co.

33—TUBING CONNECTOR for hydraulics, steam, gases

For joining tubing to tubing, or tubing to equipment, the Split-flange Connector is said to embody a design used on aircraft and ordnance equipment to keep tubing connections leak-proof and safe regardless of shock or vibration. It can't loosen, says manufacturer, because, it is



unaffected by twisting and turning of the tubing. And it is compactly designed to permit installation in restricted space.

In the simplest connection—that of joining a piece of flared end tubing to a part with a tapered shoulder—the connection connector consists of a pair of split-flanges, one sleeve with a shoulder, and four bolts, nuts and lock washers. The split-flanges are locked (one on the tubing and one on the part) and then tightened by the bolts and nuts. For applications where extreme vibration may be encountered, a wirelock may be used with the lock washers. Bulletin 407 gives full information. Barco Mfg. Co.

34—PLATING UNIT is compact and portable

Incorporating features and automatic equipment usually found only in large plating installations, the new Sel-Rex Jet Plater is said to be a complete electroplating plant in a compact, portable unit. Automatic in operation, this plater

Black & Decker® Heavy-Duty Saws are POWER-BUILT to last!

We don't buy motors—we build them!

The *heart* of your electric tool is the motor—completely built by Black & Decker. All the power you need and then some . . . because each motor is built for a specific tool and the job it must do. Black & Decker motors always *stand up!*

NEW 6½" Saw races through 2x4's . . . even at a 45° angle!

Black & Decker offers *the complete* HEAVY-DUTY saw line—with enough power and versatility for every professional need. This new B&D 6½" Heavy-Duty Saw (shown above) makes all cuts in 2x10's and smaller lumber, cuts 2x4's at a 45° angle *with blade to spare!* And all B&D Saws—6", 6½", 7", 8" and 9" models—handle practically any material: ferrous and non-ferrous metals, corrugated sheets, ceramics, tile, slate, transite. Latest safety features . . . telescoping guard, larger lift-lever, instant-release trigger switch. Latest *convenience* features . . . calibrated quadrant, larger wing nuts, for faster, easier depth and bevel adjustments . . . clear-view operation . . . easier cutting from right or left side!

And every B&D Saw is powered by a B&D-built motor—is *Power-Built* for years of satisfactory, efficient service! See your B&D distributor or write: THE BLACK & DECKER MFG. Co., Dept. 1503, Towson 4, Maryland.

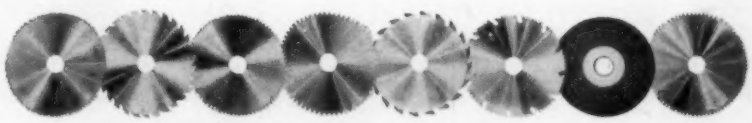
Service . . . one of 42 Black & Decker factory service branches is located "next door" to you. Staffed by experts to give fast, efficient service and genuine replacement parts.

LOOK IN THE YELLOW PAGES UNDER "TOOLS-ELECTRIC"

B&D Black & Decker®
PORTABLE ELECTRIC TOOLS

A Saw Blade for every job!

Rip, crosscut, combination, planer, flooring, friction, carbide tipped, metal cutting blades and abrasive discs—for every cutting job and longer blade life.



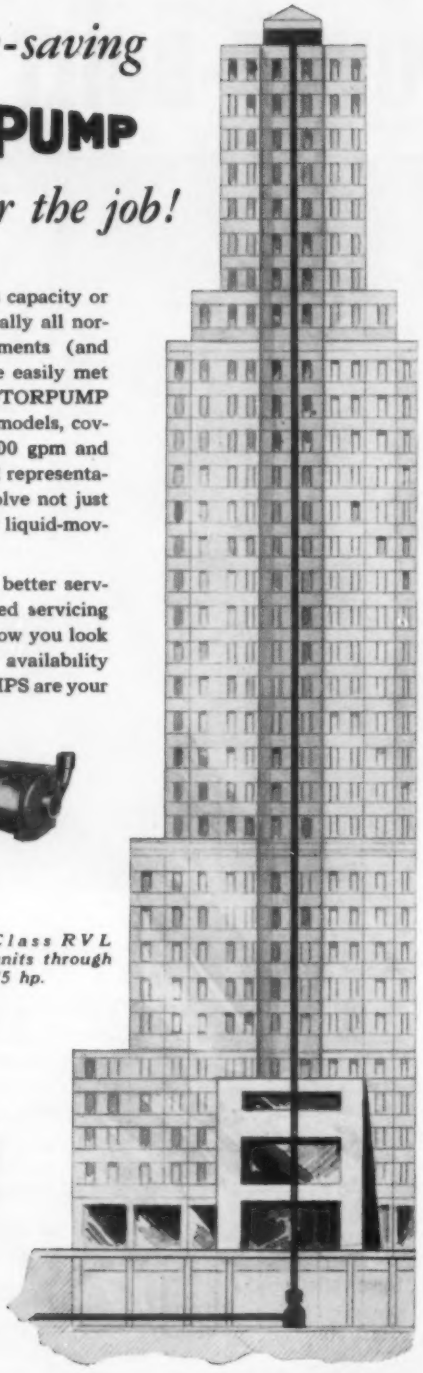
For more facts circle 598 on Reply Card

heads from 6 feet to 650 FEET

there's a space-saving

MOTORPUMP

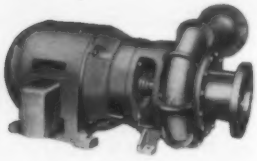
that's right for the job!



Height is no object. Neither is capacity or horsepower rating. For practically all normal air conditioning requirements (and many abnormal ones, too) are easily met by the newly expanded MOTORPUMP line. With over 200 standard models, covering capacities from 5 to 2800 gpm and heads to 650 ft., your local I-R representative is in a good position to solve not just a few, but virtually *all* of your liquid-moving problems.

This *one source* means faster, better service on all orders . . . simplified servicing and stocking, too. No matter how you look at it—dependability, versatility availability —Ingersoll-Rand MOTORPUMPS are your best buy.

Class KRVS units ⅓ through 7½ hp.



Class RVL units through 75 hp.

Class DMV units through 150 hp.

Ingersoll-Rand

9-167 ▼ 11 Broadway, New York 4, N. Y.

For more facts circle 599 on Reply Card

NEW PRODUCTS

(Begins on page 138)

consists of a selenium rectifier with automatic timer, stainless steel tank (which may serve as the anode) fitted with a water jacket for temperature control; movable work rack which will accommodate a plating barrel; centralized control panel; filter; drip-proof pump with motor.

The name of the Jet Plater is derived from the "jet" method of agitation utilized. This is accomplished through a pump and perforated steel tube at the bottom of the plating tank. The resultant constant motion of the solution around the work, manufacturer states, assures consistently smooth, even deposits. The plater needs only about 18-by-38 in. of floor space and comes in 10-, 20-, and 30-gal capacities. All can be used for "still" or "barrel" plating of any precious metal solution, small volume acid or alkaline solutions, conventional or "bright." Bart-Messing Corp.

35—STEEL POLISH passivates as it cleans

According to manufacturer, this polish accomplishes the necessary passivation to prevent corrosion of stainless steel. The polish, packaged in powdered form, is mixed with water and applied to the stainless surface. Within several minutes any ferrous contamination to the surface is removed, it is claimed, and the original luster of the surface is restored. The polish costs about $2.00 for a 2½-lb jar which makes 2½-gal of working solution. Oscar Fisher Co.

36—CURTAINS, flame resistant, for screens, booths

These flame-resistant curtains and blankets are made from impregnated canvas and designed to protect against intense heat, arc flash, molten splash, flying chips and scale. They are suggested for screening off arc welding operations and for making inexpensive booths to screen off other dangerous operations. Orders are individually processed from 8-, 10-, or 12-oz duck and from asbestos cloth in sizes up to and over 100 sq ft. Blankets are usually made with grommets in the four corners, and curtains generally include grommets placed 1-ft apart on one long side. Eastern Equipment Co., Inc.

37—STEEL BAR, high strength, free machining

Fatigue Proof Bar is announced as a high strength, free machining steel bar which requires no heat treating, yet has in-the-bar properties usually associated with heat treated steels, plus improved machinability. It also helps to cut part costs, says manufacturer. With heat treating eliminated, problems associated with it are avoided, company states, and such secondary operations as cleaning and straightening are unnecessary. The new

*Snap-Tite

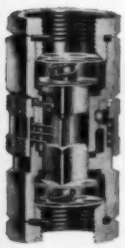
QUICK-CONNECT
QUICK-DISCONNECT COUPLINGS

in larger sizes

immediate delivery
FROM FACTORY STOCKS

SNAP-TITE'S "H" COUPLING, SIZE FOR SIZE, IS THE SMALLEST COUPLING WITH HIGHEST STRENGTH AND HIGHER EFFICIENCY

Snap-Tite's "H" Couplings are now factory-stocked for quick shipment to you, not only in the smaller sizes (below 1" ID) but in all sizes up to and including 3"—in steel, brass, aluminum, and 303 and 316 **Stainless Steel.** And "H" Couplings can be made to your order, up to 10" ID.



Available with valves to give two-way or one-way automatic line shut-off, or without valves for straight-thru flow, "H" Couplings are built to handle high pressures in hydraulic and air systems.

Recessed valve washers . . . fluted valve stems . . . valve stops with minimum flow restrictions . . . large inside diameter—allow maximum flow capacity with lowest pressure drop.

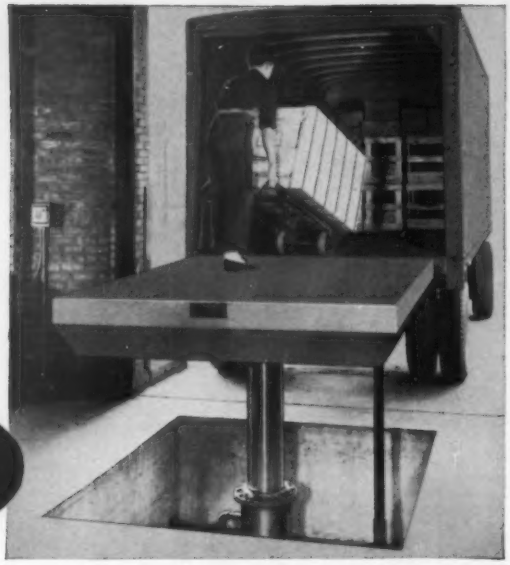
See the Snap-Tite representative in your city or write for Bulletin 240.

*Snap-Tite, INC.

UNION CITY 1, PENNSYLVANIA

SNAP-TITE COUPLINGS CAN HANDLE ALMOST ANYTHING THAT FLOWS

For more facts circle 600 on Reply Card



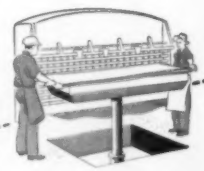
1,000
TO 100,000 LB.
CAPACITIES

Rotary Levelator® Lifts handle heavy loads faster and cheaper

Adaptable to many uses—Economical Rotary Levelator Lifts permit loading and unloading trucks and freight cars direct from plant floor level. Expensive loading docks and ramps are eliminated . . . buildings may be erected on grade at big savings in construction costs. Levelator Lifts also solve the problem of moving materials from one floor level to another and can be used in other ways to speed plant traffic and cut labor costs. When lowered, the lift is level with the plant floor and can be trucked over. Installation is easy, and there's no maintenance problem.

Economical to operate—Rotary Levelator Lifts operate on dependable, low-cost Oildraulic (oil hydraulic) power, using compressed air or electric power unit. A standard model will handle 12,000-lb. loads. Others are built to requirements for lifts of 1,000 to 100,000 lbs. Mail coupon for literature or write our Industrial Division, describing your lifting problem.

Machine Feeding—Levelator Lifts handle loads faster and cheaper than men or makeshift methods and keep materials at the right height for continuous feeding.



MAIL NOW FOR COMPLETE DATA

Rotary Lift Co.
1151 Kentucky, Memphis 2, Tenn.
Please send literature on Rotary Levelator Lifts.

Name_____ Company_____

Address_____

City_____ State_____

Rotary®

LEVELATOR® LIFTS

For more facts circle 601 on Reply Card

NEW PRODUCTS

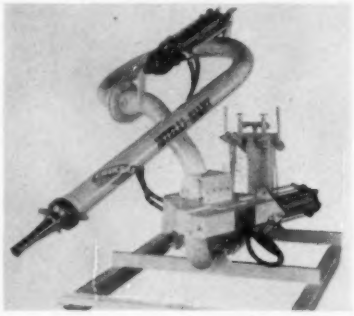
(Begins on page 136)

product is claimed to machine 25 per cent faster than annealed alloys and 50 to 100 per cent faster than heat treated alloys, with distortion from machining held to a minimum, and good finish.

Fatigue Proof is reported to offer remarkable uniformity across the bar; to be uniform in structure and maintain uniformity from bar to bar and lot to lot. Tensile strengths are in the range of 140,000 to 150,000 psi, it is noted, with a hardness related to this strength level of about 30 Rockwell C. LaSalle Steel Co.

38—FIRE MONITOR is safe, simple to operate

For efficient fire suppression, the Intelli-Giant MH-4 is designed to discharge through a 2½ in. tip a powerful stream of water at 2000 gpm, with an effective striking range of 300 ft. It is operated by hydraulic pistons with power from diverted water pressure, or can be operated manually when pistons are removed.



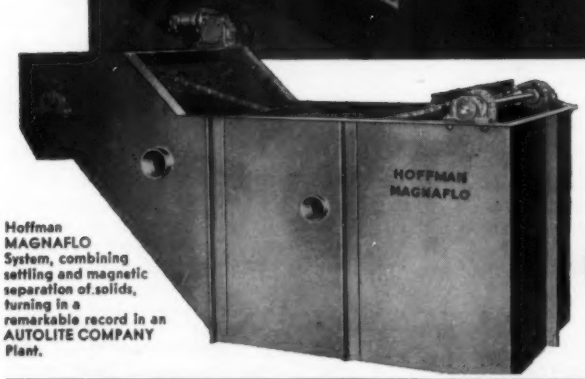
It handles water, foam and chemicals. The monitor is said to be so simple in operation that a child can, while seated, manipulate hydraulic valves and levers, covering a horizontal travel pattern of 270 deg and vertical motion of 120 deg in seconds. Pressure range is 30 to 300 lb. Excellent balance is attributed to the 270-deg tube turn that constitutes the barrel and serves to balance the vector forces. Multiple intakes of 2½ or 3½ in. hose can be adapted to the 4 in. supply pipe. Controls may be removed to a safe distance from fire for remote operation. Device may be mounted on any type of fire fighting vehicle or can be permanently stationed. Chiksan Co.

39—FITTING is quickly connected and disconnected

Only tools needed to connect and disconnect the Swagelok Quick Connect Fitting are a thumb and finger, says manufacturer; and the shutoff valve incorporated acts as a seal to prevent leakage during the operation. The fitting's internal design allows freer flow than possible with many fittings, it is claimed, and its exterior presents a slim, streamlined appearance. Used with plastic and

HOFFMAN'S ENGINEERED SYSTEMS designed to do the tough jobs in industry

FILTRATION AND CLARIFICATION OF INDUSTRIAL OILS IMPROVE MACHINE TOOL PRODUCTION UP TO 40%



Hoffman MAGNAFLO System, combining settling and magnetic separation of solids, turning in a remarkable record in an AUTOLITE COMPANY Plant.

Precision machining and grinding operations often mean costs and complications with coolant oils. However, many plants have installed a Hoffman Coolant Clarifier—and enjoy a tremendous gain in machine efficiency, and coolant economy.

Hoffman Coolant Clarifiers function automatically, assure maximum retention of coolant — with sludge discharged in near-dry state, and keep the machines supplied with abundant *clean* coolant oil. The results are better work, longer machine runs with less dulling of tools or fouling of grinder wheels, and addition of less new coolant.

Different processes are used in Hoffman Clarifiers—continuous belt vacuum filtration, aeration-flotation that floats the solids to the surface for skimming off, deep well settling with solids removed from the bottom, magnetic separation for ferrous particles, and pressure filtration. *Every* Hoffman Clarifier is designed for the best, most economical handling of the particular situation.

If handling coolant, lubricating, diesel fuel, or insulating oil is causing difficulties in your plant, see how easily a Hoffman System can end your troubles. Write or wire:

U. S. HOFFMAN MACHINERY CORP.
INDUSTRIAL FILTRATION DIVISION
DEPT. PE, 103 FOURTH AVE., NEW YORK 3, N. Y.

AIR APPLIANCE DIVISION

Multistage Centrifugal Blowers and Exhausters
Pneumatic Conveying Equipment
Industrial Vacuum Cleaning—Portable and Stationary Systems
Continuous Metal Strip Driers
"Smoothflow" Fittings and Tubing

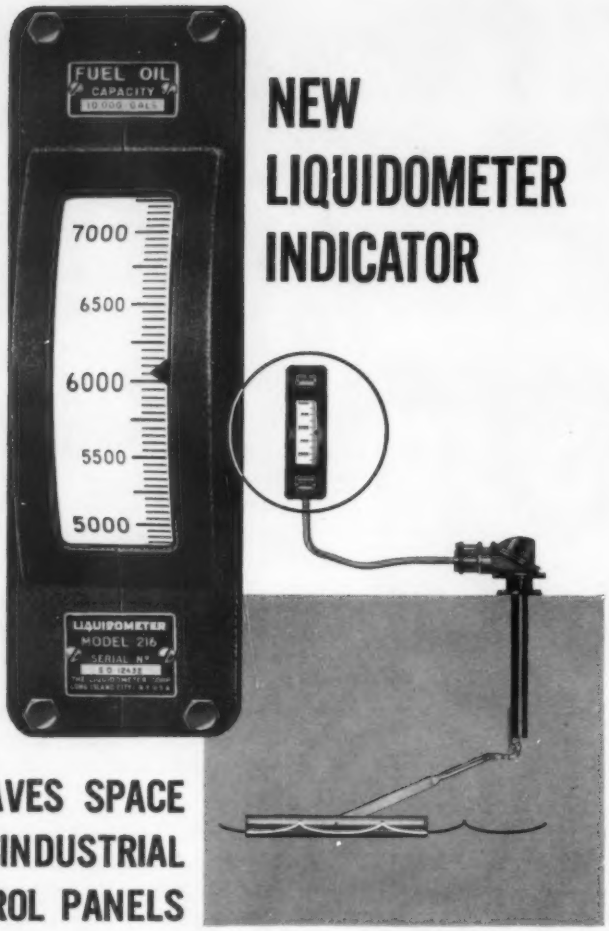
INDUSTRIAL FILTRATION DIVISION

Machine Tool Coolant Clarifiers—Flotation, Mechanical, and Magnetic.
Lubricating and Insulating Oil Conditioners, Filters, and Vaporizers
Solvent Recovery Systems—Vacuum Stills and Filters

ORDNANCE EQUIPMENT DIVISION

Special Pneumatic Conveying Systems
High Efficiency Centrifugal Separators
Stationary and Portable Vacuum Cleaning Equipment
Process Equipment
Pneumatic Systems for Radioactive Materials

For more facts circle 602 on Reply Card



NEW LIQUIDOMETER INDICATOR

SAVES SPACE ON INDUSTRIAL CONTROL PANELS

Twenty-inch dial in 3x10¼" case permits close readings

The new Liquidometer Model 216 Indicator gives the plant engineer a reliable, automatic reading of storage tank contents. Available in either vertical or horizontal design, the compact and highly readable Model 216 Indicator makes possible multiple installations on crowded control panels.

Teamed with Liquidometer's time-tested hydraulic transmission gaging system, the new indicator provides instantaneous remote indication of liquid levels—automatically. No outside power source is required. Virtually any liquid may be measured, and the indicator can be located up to 250 feet from the tank.

Engineered for dependability, the Liquidometer gaging systems highlight these design features:

- Maintenance free
- Integral temperature compensation
- Ease of installation—requires only one 2" diameter tank opening
- Safety—all gages Underwriters approved for hazardous liquids

For further details on the new Model 216 Indicator, write Dept. D for Bulletin 532.

THE LIQUIDOMETER CORP.
SKILLMAN AVENUE AT 36th STREET
LONG ISLAND CITY 1, NEW YORK

For more facts circle 603 on Reply Card

NEW PRODUCTS

(Begins on page 138)

metal tubing, the fitting is available in various metals, in sizes to fit ordinary applications and in three types: tube to tube with Swagelok ends; tube to pipe with one Swagelok end; bulkhead, either tube to tube or tube to pipe. Crawford Fitting Co.

40—FIREPROOF CHESTS offer maximum protection

These chests and safes have the same construction as large fireproof safes, manufacturer announces, and can be used any place where protection is desired. Accessible whenever needed, the safes are finished in a metallic gray on the outside with a velour type trimming on the inside in a contrasting maroon. Five models are available—a storage chest; an indexed vertical file chest; a miniature private protector box; a wall safe; and a floor safe—all of which are designed to offer fire protection for one hour at 1700 F, except the miniature private protector which meets a test of ½ hr at 1550 F. Lyon Metal Products, Inc.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 201-202.

41—COMPRESSOR is compact, unit in 100 to 300 hp range

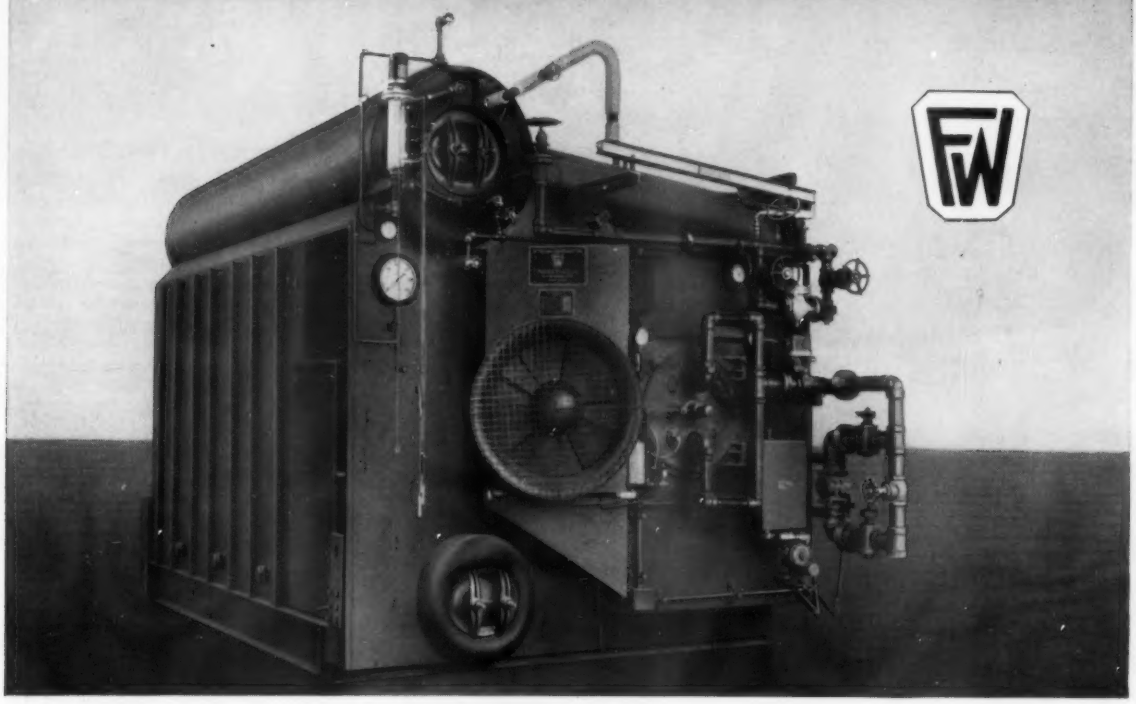
Expected to find widespread use in foundries and metalworking areas where compressed air is used to actuate pneumatic machinery and portable tools is the Type FMP Compressor. It is described as a compact, yet rugged, reciprocating compressor in capacities from 100 to 300 hp. The Cooper-Bessemer Corp.

42—ATTACHMENT handles crates, fiber cartons

For palletless handling of equipment in crates or in drum-type fiber cartons, this attachment combines a finger lift device with an addition for handling the fiber packaging cartons. The finger lift attachment mounts 40 spring-loaded fingers across its top. As the attachment contacts a crate, the fingers which encounter crate members are pushed back against their springs, out of the way. Those finding no obstruction enter the crate. When the attachment is lifted, these engage horizontal crate members and the crate is thus lifted.

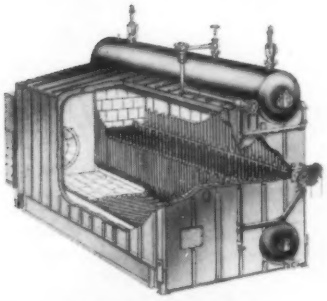
The new addition to the attachment includes two vertical swiveled plates, called carton lip plates, mounted above the fingers. These are used to pick up the type of container known as cap-and-tube, or drum type. With this double-

REDUCE YOUR STEAM COSTS THREE WAYS



with the New Foster Wheeler

PACKAGED STEAM GENERATOR



CONSTRUCTION FEATURES

- 36" steam drum and 24" water drum
- Staggered boiler tube arrangements
- Closely spaced waterwall tubes
- Water cooled target wall
- No headers — Low circulation loss
- Light, highly efficient refractory and insulation
- Wide choice of burners and controls
- Baffled steam collector

You save on *first cost* because the FW unit is pre-engineered and shop fabricated from standard parts by the most modern, efficient and cost-saving production methods.

You cut *installation cost*, with a compact, space-saving unit that's shipped completely assembled — all ready to set on a simple foundation — all ready for your fuel, steam and electric connections.

You save *operating cost* all year 'round, because FW Packaged Steam Generators are designed for high sustained efficiency and exceptional ease of inspection and maintenance.

The NEW Foster Wheeler Packaged Steam Generators, in capacities from 10,000 to 46,000 lb/hr, represent the last word in modern steam plant design, reflecting more than 50 years of service to the power generation industry.

For complete details, send for Bulletin No. PG-55-3.
Foster Wheeler Corporation, 165 Broadway, New York 6, N.Y.

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

For more facts circle 604 on Reply Card

AE STANDARD LO-HED

the hoist that gives you important **extras** *at* **no extra** *cost*

FROM THE STANDPOINT of engineering and materials, Standard Lo-Hed is the most modern heavy duty hoist ever put on the market. This is a really heavy duty hoist, *not* one that wears out in a few years. It's made in 2- and 3-ton capacities... quantity-produced for moderate prices and delivery straight from stock. More than that, Standard Lo-Hed gives you—*for free*—a whole group of extras that usually cost real money. Among these extras are:

- Hoisting speed: 20 ft. per minute;
- Lower limit safety switch;
- Spider for gears to permit checking with cover off;
- Anti-friction thrust bearing on hook nut;
- A 110v pilot circuit on AC voltages of 220v and up;
- All-steel, welded construction combining light weight and rigidity.

Standard Lo-Hed Hoists are pulling down materials handling costs the country over. They're available in your choice of bolt suspension, plain trolley, hand-geared trolley and motor trolley types. Write for fully descriptive literature.

★ ★ ★ ★ ★

If you have special heavy duty requirements, AE's feature-packed Customized Lo-Hed could be the perfect answer. It's engineered in capacities from ¼-ton to 12 tons, and in five suspension types. Talk it over with your local Lo-Hed representative.

AMERICAN ENGINEERING COMPANY

DEPT. H-164, WHEATSHEAF LANE & SEPVIVA ST., PHILADELPHIA 37, PA.

Canadian Subsidiaries: Affiliated Engineering Corporations, Ltd., Montreal, P. Q.... Bawden Industries Ltd., Toronto, Ont.

AE products are: Taylor, Perfect Spread and Vibra-Grate Stokers, Hele-Shaw and Hydramite Fluid Power, Lo-Hed Hoists, Lo-Hed Car Pullers, Marine Deck Auxiliaries.

For more facts circle 605 on Reply Card

NEW PRODUCTS

(Begins on page 138)

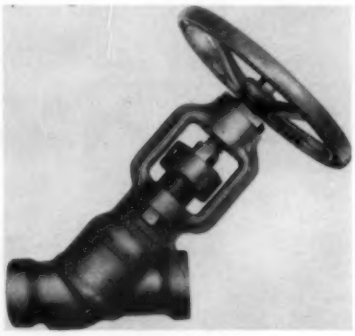
purpose attachment, one truck can handle either crates or drum-type cartons. Baker Raulang Co.

43—TANK THERMOMETER resists chemical action

The Scoopmaster is especially designed for applications where chemical action of such compounds as aromatic hydrocarbons or petroleum products is critical. Its 120-ml capacity cup case is molded of heat-resistant, non-sparking plastic which has minimum thermal conductivity to assure maintenance of sample temperatures. A choice of temperature ranges is offered from a low of —30 F to a high of 500 F, with graduations engraved on a 14-in. red-reading, wide bore tube. The tube is held in place with spring clips. Weksler Thermometer Corp.

44—VALVE for high pressures, high temperatures

Welbond Valves are suggested for general boiler room use including drain service on water wall headers, economizers, water columns and gages; drain and vent services on superheaters and steam lines; shut-off service on sampling lines, bypasses, water gages, water columns and



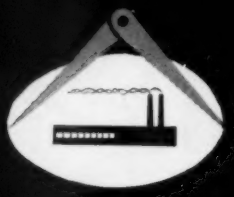
instruments. Valves feature a compact design and materials selected to resist high pressure, high temperature service. Integral seat of heavy stellite is welded on the seat nozzle and finished before the nozzle is welded to the body. An annular groove is incorporated to absorb thermal changes near the seat, prevent distortion during assembly welding, and permit a positive seal when the valve is closed. Welbond valves are available in seven sizes from ½ to 2½ in., angle and straightway patterns, socket weld ends, and for pressures 1,500 and 2,500 psi at 1050 F. Yarnall-Waring Co.

45—MAGNESIUM LADDER is adjustable four ways

Designed for use as a stepladder or straight ladder, this unit can also serve as an extension ladder and one for use on uneven levels such as stairs. Manufacturer says it takes less than 30 sec to

For more facts circle 606 on Reply Card →

Using DU PONT ELASTOMERS
NEOPRENE - HYPALON®



in Industry

HYPALON® GASKETS STILL SERVICEABLE AFTER TWO YEARS, 2% OZONE EXPOSURE

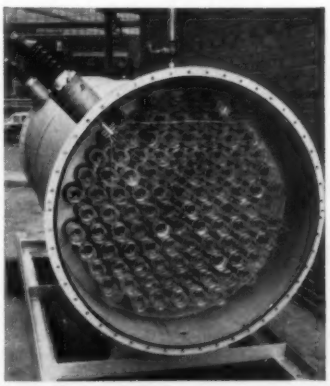
For two years a large chemical firm has used gaskets of HYPALON synthetic rubber in its ozone generators. Despite constant exposure to 2% ozone during that period, not one gasket has shown any sign of ozone cracking.

The ozonator (see below) is a steel shell packed with glass tubes. As dry oxygen passes through the tubes, it is converted to ozone by high-voltage electrical discharge. The ends of the steel shell are closed with dished heads sealed with HYPALON gaskets.

Plastic Gaskets Too Rigid

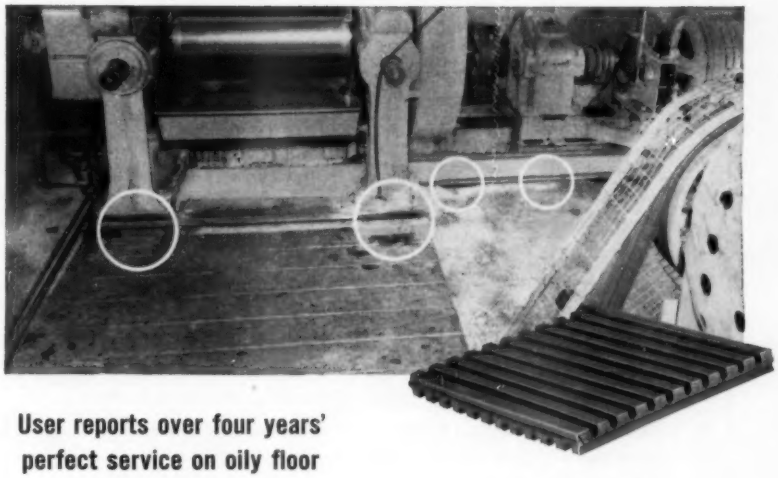
Formerly, the manufacturer of the generator used plastic gaskets. Though unaffected by ozone, the gaskets took a permanent set under flange pressure and couldn't be reused.

HYPALON has many other advantages. Compared to other kinds of rubber, HYPALON shows unusual resistance to hardening at elevated temperatures (250°-350°F.). It resists strong oxidizing chemicals. Indoors or out, products of HYPALON can cut maintenance costs for you on the really "tough" jobs where severe service conditions exist. Just clip coupon for further information.



HYPALON gaskets are used to seal each end of this ozone generator.

Neoprene pads support 22,000-lb. mill, reduce noise and cut vibration 75%



User reports over four years' perfect service on oily floor

This rubber mill mixes compounding ingredients into crude rubber. It's a brute-strength operation. The mill weighs 22,000 lbs.; power consumption is high; load changes are almost instantaneous. Normally, the level of noise and vibration is extremely high even though a rubber mill is bolted to a separate concrete foundation pad to reduce vibration.

An answer to this problem of vibration was discovered by the operators of the rubber mill shown above. They constructed a sub-base for it by welding a number of I-beams together and then bolting the mill assembly to the beams. The beams in turn rest on twenty 15-16-in.-thick neoprene pads, which are especially designed to dampen vibration, and which cover a total floor area of only 3.7 square feet.

No floor bolts needed

The resilient neoprene pads support the entire mill and eliminate the need for bolting it to the floor. There is far less noise *and vibration has been reduced 75%*. A precision grinder operating ten feet away maintains close tolerances with the mill in operation.

The simplicity of the mounting saved installation costs because the vibration dampening qualities of neoprene eliminate the need for a concrete pad. As for durability, the neoprene pads have been performing perfectly for 4 years despite constant exposure to grease and oil.

This is just another example of cost savings obtainable through neoprene. Just clip the coupon for further information about neoprene's superior performance.

DU PONT
REG. U.S. PAT. OFF.

HYPALON *is a registered trademark of E. I. du Pont de Nemours & Co. (Inc.)*

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

Please send further information and add my name to the mailing list for your free publications, the "Neoprene Notebook" and "Facts about HYPALON®," which show how the Du Pont elastomers are used to cut maintenance and replacement costs, improve production.

E. I. du Pont de Nemours & Co. (Inc.)
Elastomers Division, Dept. PL-3
Wilmington 98, Delaware

Name_____ **Position**_____

Firm_____

Address_____

City_____ **State**_____

THE *Pitch* IS IMPORTANT IN A

WARREN-QUIMBY SCREW PUMP

The capacity of this pump is determined by the *"pitch" of the screws* and the full load speed of the motor. Expert engineering knowledge of just the right pitch, number of threads, experience data, and precision workmanship are all mighty important in this highly specialized type of pump. It is available in two general types:

Gear-in-head, with internal gears and bearings, for handling lubricating liquids free of corrosive elements and solids.

Double External Bearing and Gear, with separately lubricated gears and bearings, for handling all other liquids.

Standard pumps include jacketed, unjacketed, horizontal, vertical pedestal, vertical bulkhead, long body and hopper types in all machinable metals. Capacities, up to 3000 g.p.m. and pressures up to 700 p.s.i. on low viscosity liquids, and practically unlimited for high viscosity liquids which will flow into the pump inlet.

For specialized services involving hard-to-handle materials, insist upon Warren-Quimby, the original Screw Pump . . . now owned, greatly improved, manufactured, serviced and guaranteed by Warren . . . one of the pioneers of the Pump Industry.

Centrifugal • Reciprocating • Rotary

Write for Bulletin WQ-S205

WARREN QUIMBY PUMPS

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.

Warren, Massachusetts

For more facts circle 607 on Reply Card

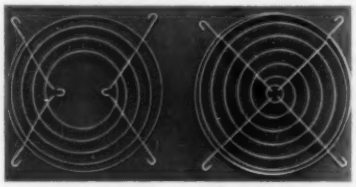
NEW PRODUCTS

(Begins on page 138)

extend and lock the back legs to convert it into an extension ladder. Light weight is a feature of these magnesium ladders, and they are said to be sturdily designed with wide 3½-in. steps, 3½ in. rail front section and welded runged back section. They have serrated hard rubber feet and a bucket rack. There are five sizes. The smallest, 6 ft, extends to 10 ft, weighs about 13 lb, and costs less than $35. The largest, 10 ft, extends to 18 ft, weighs 22 lb. Abbeon Supply Co.

46—MOTOR MOUNT with continuous spiral design

The principal wire member of this motor mount assembly is actually a wire, cross welded to support wires. Continuous spiral design, replacing concentric circle type of construction, eliminates butt welding and swaging opera-



tions otherwise used on each individual ring. Natural resiliency of wire assembly absorbs motor vibration, company states, and permits reduced noise-level decibel ratings. The spiral design, combining improved appearance with light weight, requires less tooling and machining. Adaptable to all types of industrial motor applications, these combination guard and mount assemblies are available in various platings and finishes to meet specific installation needs. E. H. Titchener & Co.

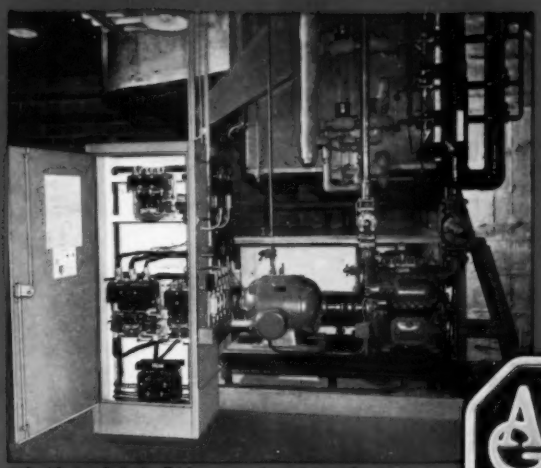
47—FORK TRUCK is 3000-lb capacity model

Second of this company's Cargo-Scouts, this 3000-lb capacity fork truck is designed to handle loads in confined areas at maximum speeds. It is compact, with a short wheelbase and 360-deg steering to permit maneuvering in narrow aisles and inside truck trailers and box cars. A device is provided on the steering mechanism to prevent wheel kick-back, it is noted, and stand-up end control affords convenience where operator must get on and off frequently. It has a 3000-lb capacity at 24 in. on a 68-in. high model; at 20 in. on an 83-in. high model. The Elwell-Parker Electric Co.

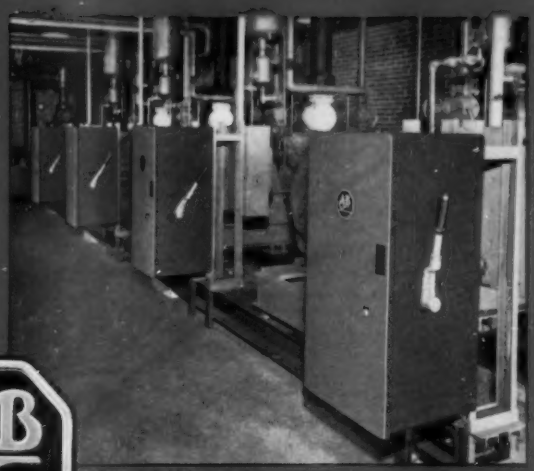
48—V-S DRIVE permits constant full load torque

The Theratrol is announced as a variable speed motor drive consisting of a d-c motor with an electronic rectifier power supply. This thyratron control permits constant full load torque at all speeds from minimum to maximum, says manufacturer, and it has a speed range of ten

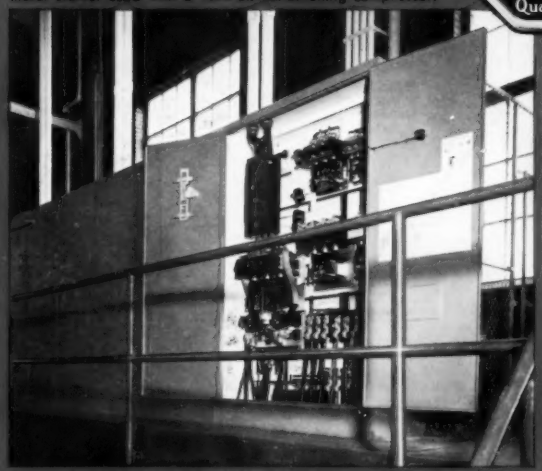
For more facts circle 608 on Reply Card



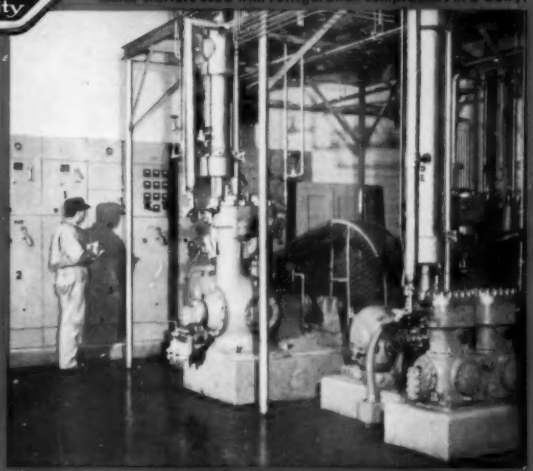
A-B 60 hp Bulletin 746 automatic autotransformer-type motor starter used with a York air-conditioning compressor.



Four A-B 125 hp Bulletin 646 manual autotransformer-type motor starters used with refrigeration compressors in a dairy.



A row of A-B 350 hp Bulletin 761 automatic slip-ring motor starters with circuit breaker disconnects in the Milwaukee sewage disposal plant.

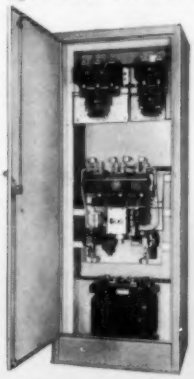


Allen-Bradley Bulletin 798 multi-unit control center used with motors ranging from 10 to 75 hp installed in a southern Kraft food plant.

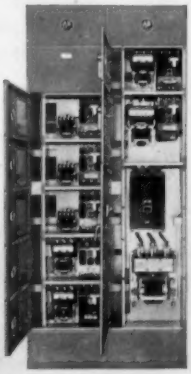
ALLEN-BRADLEY STARTERS FOR LARGE A-C MOTORS ARE AS POPULAR AS THE BULLETIN 709 SIZE 1 FOR SMALL MOTORS

Allen-Bradley manual and automatic starters for large squirrel-cage, slip-ring, and synchronous motors—both high and low voltage—have earned the same reputation for "Quality" for which the lower ratings are known. Every operating requirement can be satisfied, either with individual units or as sections of a multi-unit control center.

Allen-Bradley high voltage starters are rated up to 1500 hp with voltages ranging from 2000 to 4600 volts. The high voltage, synchronous motor starters are self-protecting against short circuits up to 250,000 kva on 2501-4600 volts, 3 phase, 60 cycles. Oil or air break switching available. Please write for the Handy Catalog.



A-B automatic autotransformer, reduced voltage starter with cabinet open to show control panel.



A-B multi-unit control center with compartment doors open to show various types of motor controls.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
SOLENOID STARTERS
QUALITY

3-56-MR

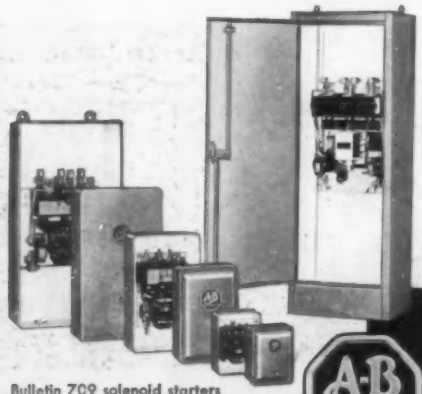
ALLEN-BRADLEY SOLENOID CONTACTORS HAVE SILVER ALLOY CONTACTS
NEVER CLEAN, DRESS OR FILE THEM
EVEN THOUGH CONTACTS APPEAR PITTED AND BURNED OR ARE ENTIRELY BLACK, THEY WILL GIVE SATISFACTORY OPERATION
CONTACTS NEED REPLACEMENT ONLY WHEN THE SILVER ALLOY HAS BEEN WORN AWAY
A-B
ALLEN-BRADLEY CO.

Left—Allen-Bradley Size 7 solenoid contactor used in large solenoid starters.

Below—Allen-Bradley Size 7 solenoid starter with overload relays in NEMA Type 1 general purpose, floor mounted enclosure.

ALLEN-BRADLEY SOLENOID STARTERS USE DOUBLE BREAK, SILVER ALLOY CONTACTS THROUGHOUT!

Eight Sizes up to 300 hp, 220 v; 600 hp, 440-550 v.



Bulletin 709 solenoid starters shown here in Sizes 0 to 6—all equipped with accurate and reliable overload relays.

All starter manufacturers use the solenoid construction and double break, silver alloy contacts for their lower starter ratings, because experience has proved this construction superior to any other. Therefore, wouldn't this experience repeat itself with the higher rated starters?

Allen-Bradley has found this to be absolutely true. Its starters of high hp rating are regularly establishing new standards of starter performance. As you go from size to size, the operating characteristics remain the same—you get trouble-free, long-life performance.

Standardize on Bulletin 709 solenoid starters—they are Tops in Quality!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

3-56-MR

A-B Quality

ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY

No other drive does all these jobs like

Link-Belt SILENT CHAIN

YES, if you need a drive like any one of these six, you're money ahead with SILENT CHAIN

COMBINING the flexibility and quietness of a belt with the positive action and durability of a gear — Link-Belt Silent Chain offers unmatched advantages for a wide range of drives. Check these reasons why:

- Lower cost—often lower in first cost, always lower in ultimate cost.
- Longer life — trouble-free performance for 25 or 30 years is common.
- No dismantling machine or removing sheaves for repairs.
- Better than 98% efficiency.
- Maintained ratio assures full productive capacity.
- Slipless action assures a better product.
- Easy to install.
- Safe to employees — operates in oil-retaining casing.

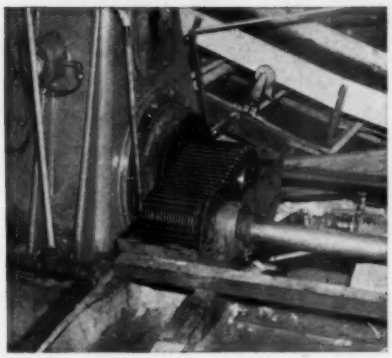
New 88-page Book 2425 gives complete data on silent chain. Ask a Link-Belt engineer or distributor for your copy today.

LINK-BELT

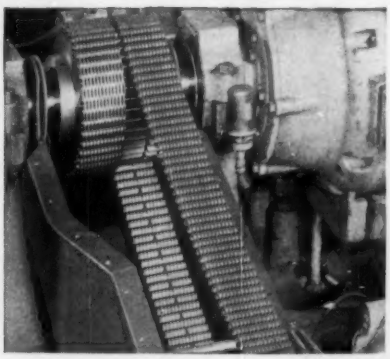
13,002

SILVERSTREAK SILENT CHAIN DRIVES

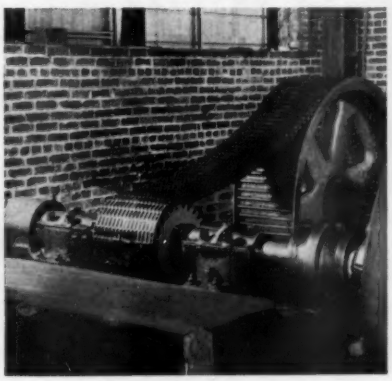
LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.



1 **Production increased 33%** when speed of this peeler lathe was stepped up by installing two silent chain drives. Neither engine nor lathe had to be moved.

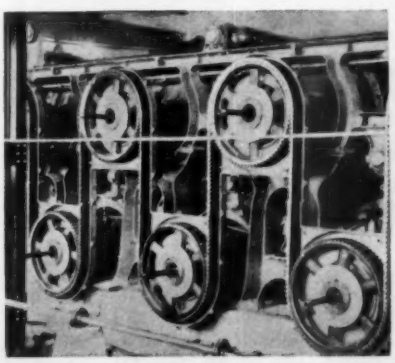


2 **Constant, high speeds** were assured by equipping each of 48 automotive test stands with two Link-Belt Silverstreak Silent Chain Drives.

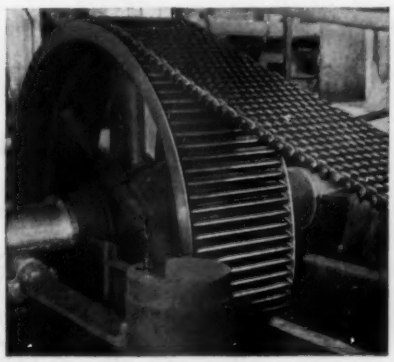


3 **Long life under severe service**—This 250-hp Link-Belt Silent Chain Drive has operated line shaft in cold draw section of seamless tube company since 1916.

4 **Fractional hp drives** are positive and dependable with Link-Belt Silent Chain. Above, two 3/16" pitch chains drive machine fabricating refrigerator parts.

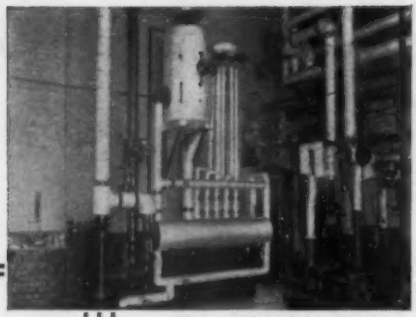


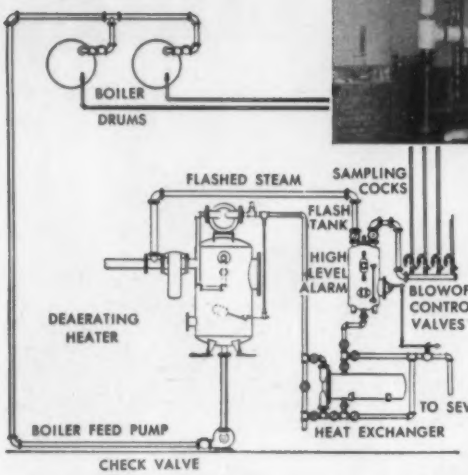
5 **Accurate timing** is guaranteed for this dryer by Link-Belt Duplex Silent Chain. All shafts travel at uniform angular velocity, permitting precise coordination of process.



6 **Minimum maintenance**—This is one of 24 Link-Belt Silent Chain beater drives in a pulp mill. All have operated for many years with little attention.

For more facts circle 609 on Reply Card





Photograph and drawing showing installation of a Cochrane Class I Continuous Blowoff System of the type most frequently encountered. This sytem is recommended for use where heat recovered from the Cochrane Continuous Blowoff System does not exceed the rating of the feedwater heater.

Here are some typical savings with a Cochrane

CONTINUOUS BLOWOFF SYSTEM

- **A Utility: $15,400.00 annually**
- **A Sugar Refinery: 3,500.00 annually**
- **A Power Plant: 6,700.00 annually**
- **A Packing Company: 1,500.00 in first year**

(Names of companies on request)

Rising power plant operating costs make complete utilization of heat more important to your company than ever before. With a Cochrane system you can recover practically *all of the heat of the blowoff*. Both flashed steam and heat from hot waste water are returned to the feedwater system.

In addition, Continuous Blowoff provides more uniform boiler concentrations, smoother boiling conditions and cleaner steam.

Cochrane Corporation designs and manufactures complete lines of deaeration, precipitation, ion exchange and water conditioning equipment. Call Cochrane first for water treatment.

Write for Cochrane Publication No. 5700.

Cochrane
CORPORATION
3126 N. 17TH STREET, PHILADELPHIA 32, PA.
NEW YORK • PHILADELPHIA • CHICAGO

Representatives in 30 principal cities in U.S.; Toronto, Canada; Paris, France; La Spezia, Italy; Mexico City, Mexico; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.

Pottstown Metal Products Division—Custom built carbon steel and alloy products

Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors Deaerators • Continuous Blowoff Systems • Condensate Return Systems • Specialties

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 138)

to one. Electronic rectifier power supply is a grid controlled regulated variable armature supply and fixed field supply. Six xenon-filled thyratron tubes accomplish armature rectification; no other tubes or thermionic devices are used. Maximum armature current is limited by a control circuit adjustable from 100 to 200 per cent of full load, it is explained, and the current cannot exceed this pre-set value, even though motor is stalled with the speed control in maximum position. Pulse firing of the thyratron tubes is designed to eliminate electrical interference, and assure stable control settings.

The Theratrol is designed for three-wire remote control. Applications reported for it include fan drives. The Theratrol units are available in 10 to 50 hp sizes, 450 to 3600 rpm. Ther Electric Works.

49—CEILING DIFFUSER is adjustable from floor

Model BP Venturi-Flo features a variation of air patterns from horizontal to vertical and is declared capable of driving hot air to the floor from mounting heights up to 50 ft, even with temperature differentials as high as 40 F. Greater

projection of warm air is possible with lower temperature differentials. Because it is adjustable, and capable of long vertical throws, it is suggested for use in manufacturing areas, auditoriums and similar structures. Adjustment can be made from the floor to provide air patterns ranging from vertical to horizontal. When this is not practical, an adaptor unit can be furnished to permit adjustment through the duct from the crawl space above the ceiling. Catalog F 7722 gives data. Barber-Colman Co.

50—STEEL GRIT for producing etched finishes

Steeletts is the name of this steel grit blast cleaning abrasive for producing etched finishes. The grit is of high-carbon electric arc furnace steel, heat treated for toughness. It is in the same hardness range as chilled iron abrasives, it is explained, yet free from brittle carbides. Steeletts particles do not chip away upon impact, says manufacturer; the grit shape

Now—for maximum Roof Protection
Johns-Manville

Aquadam

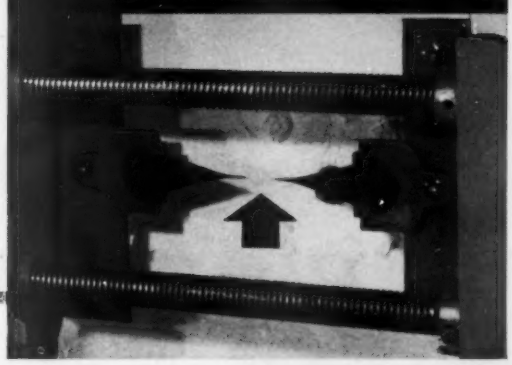
(slate or smooth surfaced)

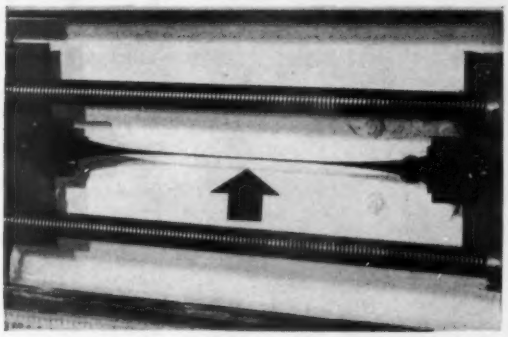
Built-Up Roofs*

Aquadam offers these important advantages:

- Superior resistance to cracking
- Superior weather resistance
- Improved self-healing properties
- Greater kettle stability
- Greater adhesion—stronger bond
- Greater resistance to water
- Excellent uniformity

Here's conclusive proof of Aquadam's greater resistance to cracking!





Top: a typical asphalt shown at average breaking point of 12 CM.

Bottom: Aquadam at a 25 CM stretch—100% beyond average—won't break even when stretched to 110 CM.

J-M Aquadam proved superior by actual test... helps provide longer roof life at no extra cost

Johns-Manville Aquadam is specifically designed to provide maximum built-up roof service for deck inclines from dead level to ½″ per foot*.

J-M Aquadam Built-Up Roofs owe their proven superiority to the newly developed bituminous asphalt cementing agent Aquadam—which is used in the application of the roofing felts.

When applied, the excellent adhesive properties of Aquadam provide a permanent bond to the felts, and to gravel or slag surfacing. Its rigidly controlled quality and excellent flow properties assure easier mopping, thorough coverage, and longer lasting roof life.

Your local Approved J-M Contractor, listed in the classified telephone directory, has complete information about Aquadam Built-Up Roofs. Or write Johns-Manville, Box 158, New York 16, N. Y. In Canada, write 565 Lakeshore Rd. East, Port Credit, Ont.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville

For more facts circle 611 on Reply Card

How Did Wyman-Gordon Cut Out ALL Lost Production Time In Moving a Machine Shop?

←Here's the answer

The old-timers said it couldn't be done in less than five days — but Barry Leveling Mounts so speeded the reinstallation of lathes, millers, and grinders that the entire moving operation took only a two-day weekend. The vital test-preparation department was ready for work again on Monday morning. The machines set on Leveling Barry Mounts required no drilling of floors, no lagging, no shimming — they were just spotted according to plant layout, and quickly leveled. And because Barry Mounts isolate vibration, the machines do not walk, building-borne noise is reduced, and the accuracy of the precision machines in the Test-preparation Department is protected.

Ask Barry how YOU can cut machine-moving costs.

How Did Bullard Stop ALL Toolroom Rejects Due to Vibration?

With the Bullard Company's toolroom only 50 feet from a main-line railroad track, the vibration from passing trains often caused work spoilage or lost time as grinder operators waited for trains to pass. Moving the toolroom was out of the question. But the seven surface grinders were isolated from external vibration by a simple installation of Leveling Barry Mounts under each machine — at a cost of only $50 per machine. Rejects due to vibration were completely eliminated!

Ask Barry how YOU can protect precision machinery.

How Can YOU Gain These Advantages?

It's easy. Write for our plant survey booklet M-256 that tells you where to look for savings in your plant, then talk over your machine-mobility needs and vibration problems with a Barry representative or Barry Mount distributor.

BARRY CONTROLS
INCORPORATED
SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

BARRY B MOUNT
SOLD THROUGH INDUSTRIAL DISTRIBUTORS

910 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

NEW PRODUCTS

(Begins on page 138)

endures for hundreds of cycles without the sharp edges caused by fracturing.

Steeletts grit is claimed particularly adapted to: providing a deep etch on metallic surfaces for bonding; providing lustre on non-ferrous work by exposing virgin metal and giving it a matte-type surface; descaling alloy forgings and heat treated work; etching steel mill rolls. Steeletts come in seven sizes from G-16 down to G-120. They are packaged in 50-lb fiberboard cartons and shipments of a ton or more are made on disposable pallets. Wheelabrator Corp.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 201-202. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

51—FLOW VALVE offers unusual sealing qualities

Ability to make a positive seal under practically every condition is claimed for this recently announced flow valve. Its inventor says a 1-in. test model will close over a pencil, a 1¼-in. steel screw, five pennies, or nearly any article small enough to insert. The valve will close securely on flood gates, it is stated, whether or not a log or other debris is present. According to company, the valve itself can be made of practically any material to withstand pressures to 15,000 psi and temperatures to 400 F, the flexible sleeve can be made of various synthetics and the unit can be designed to fit plant conditions. It is so constructed that it lends itself to remote control equipment. American Flow Control.

52—INDUSTRIAL WIPER now comes in a smaller size

For the many industrial wiping jobs in which this company's widely used — and still available — No. 59 Wiper is not required, a new and smaller sized paper wiper is offered. The No. 58 consists of two-ply sheets measuring 9⅝ by 10¼ in. Like the No. 59 Wiper (9⅝ by 13⅝ in.) the new product is packaged 125 to a box. Scott Paper Co.

53—ACOUSTICAL TILE comes in several textures

Ebbtone Acoustical Tile is now available in striated, grained and standard plain textures, in 12-by-12 or 12-by-24 in. sizes. It comes factory kerfed beveled, and back-cut for suspension systems, or may be applied with adhesives. Ebbtone is described as a foamed mineral composi-

←For more facts circle 612 on Reply Card

NEW PRODUCTS

(Begins on page 138)

tion with a light reflectant value of 81 per cent, a noise reduction coefficient rating of 0.75 and a sound absorption coefficient of 0.77 at 500 cycles. It is rated incombustible by Underwriters fire hazard classification, says manufacturer; and while it requires no additional finishing, it may be painted with any non-bridging paint without materially affecting its acoustical properties. Texture samples and specification data are offered. F. E. Schundler Co.

54—SOLVENT CEMENT for PVC piping systems

For joining polyvinyl chloride pipe fittings and flanges, this solvent cement is claimed to make possible a joint as strong as or stronger than the pipe itself, and to bridge a greater diametral gap than previously available bonding agents. It is declared simple and economical to use—a paint brush serves as the applicator. Manufacturer says a cemented joint can be handled in 1 hr, has working strength in 48 hr. Tube Turns Plastics, Inc.

55—SILENCERS for pneumatic-operated equipment

Quietaire Pneumatic Silencers are all-metal units designed to reduce sound in noise-shock areas close to the level found

in the average industrial plant (75 decibels). Tests are reported to show that operating efficiency is not impaired while the noise is dampened. Quietaires have no parts that need replacing, and they are claimed corrosion-resistant and safe for any pressure normally encountered in industrial pneumatic service. Compact and easily attached, these silencers come in four models to fit most industrial air-operated equipment. C. W. Morris Co.

56—STATIC BALANCERS, are vertical machines

Of these two new vertical static balancing machines, the smaller, Model 201-VL, has weight capacities of 1 to 20 lb and will handle diameters to 20 in. The Model 201-VH handles 5 to 75 lb and diameters to 20 in. Field installations of these balancers are reported to demonstrate that their simplicity of operation assures ease of use by unskilled operators in balancing impellers, blower wheels, flywheels, fans, pulleys and other parts having no integral shaft. Magnitudes of

For Removal of Dust, Fumes, Gases, etc., flexible

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does the job better . . . cuts maintenance costs!

Lightweight Spiratube® is the answer to many an application where fume removal, ventilation and dust problems are concerned. Because of its patented preformed helical wire support design, Spiratube "springs to work" and stays extended even on tight turns . . . costs less to install and maintain—downtime is reduced to a minimum—and Spiratube can snake around and over obstructions, eliminating the use of costly elbows and fittings.

Spiratube is ideal for portable and semi-permanent applications. Sections can be linked together or detached in a matter of seconds without the use of tools. If machine changes are made, Spiratube can be assembled and disassembled and reused over and over again.

Spiratube is available in sizes from 3" to 30" in a variety of covers. Investigate this low-cost method of air or dust handling today. Stocks are available from leading distributors across the country. For further application information about this product, please send coupon below.

•

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Please send me illustrated catalog and more information on Spiratube.

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For more facts circle 613 on Reply Card

HERE'S FULL-TIME PROTECTION FOR TEMPORARY CIRCUITS

For temporary circuits needed in construction work and other outside jobs, the Heinemann "Receptacle-Type" Outdoor Service Unit provides on-the-spot power with full circuit protection.

Combining convenient utility with absolute protection, this Heinemann Outdoor Service Unit has wired-in receptacles for tools, pumps, floodlights and other equipment. It's a portable, fully protected service unit that can be carried from job to job . . . without makeshift arrangements. The only connections needed are those directly to the line.

As Heinemann Circuit Breakers employ no thermal elements, current capacity of the unit is not affected by summer or winter temperature extremes—an especially important feature in outdoor equipment.

Should a fault in the line trip the breaker, the user restores current simply by switching the handle to the "ON" position. There is no confusing reset position . . . no need for the power company to make extra service calls.

"Receptacle-Type" Outdoor Service Units are housed in rugged, weather-proof enclosures which may be padlocked to prevent tampering. Plug-in receptacles are on the bottom. Also available with spring-hinged door to enclose receptacles when not in use.

For complete details, write for Bulletin 2016

HEINEMANN ELECTRIC CO.

128 PLUM STREET • TRENTON 2, N. J.

HEINEMANN Circuit breakers

For more facts circle 614 on Reply Card

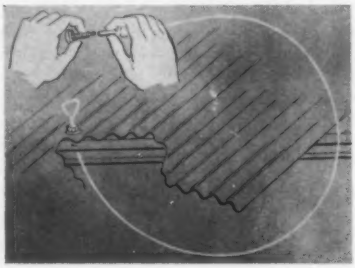
NEW PRODUCTS

(Begins on page 138)

unbalance are indicated by a large, easy-to-read meter calibrated in terms of unbalance procedure selected. Angular positions are pointed out by a stroboscopic lamp, and are readable either as a location to remove weight or as a location to add weight. Balance Engineering Co.

57—FASTENER for corrugated roofing and siding

For weather-proof bolting of corrugated roofing and siding, the DS Bolt is installed from the top side of new or replacement roofing jobs. DS Bolts include these components: cadmium-plated bolt, composition washer, combination metal and Neoprene washer, stainless double-chamfered nut and a wire with brass sleeve attached to one end. In application, several nuts and washers are strung

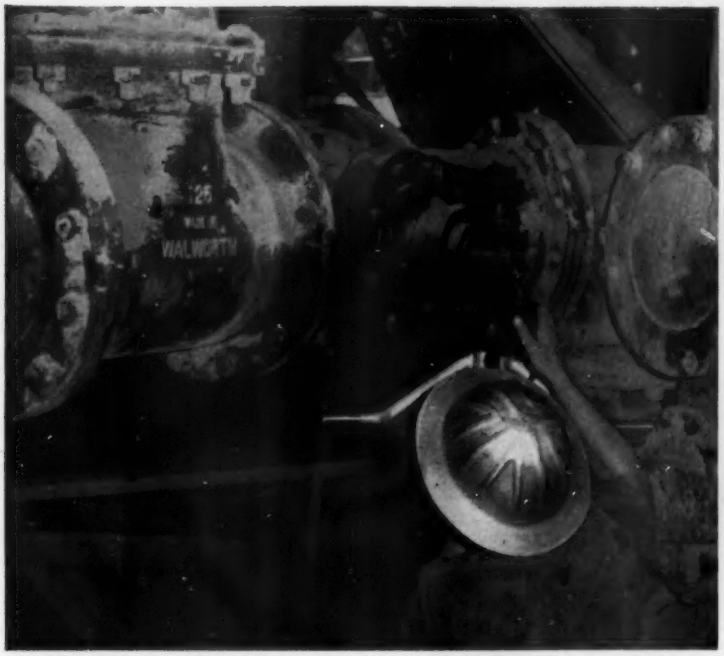


on the wire and the brass sleeve is placed through a drilled hole in the sheeting. The wire loops back to within reach, and a DS Bolt is attached to the brass sleeve on the end of the wire. The wire is then drawn back through the hole, pulling bolt into position. A washer and nut are dropped over the bolt, and the nut tightened by hand. Sleeve and wire are removed and the nut tightened by a power wrench. Bolts are installed in seconds, says manufacturer.

It is explained that DS Bolts are installed at the high of the corrugation, rather than the low, to reduce corrosion and permit expansion or movement without shearing the bolt. Torque required is less than for most fasteners. Installed from top of roof, DS Bolts require no scaffolding, it is noted, and the projecting nut and threaded end of the bolts provide a foothold for workmen. Delbert L. Smith Co., Inc.

58—TUBULAR FILTER has self-cleaning feature

Useful for water or chemical purification, the Hydra-Shoc builds up air pressure at the end of the filtering cycle and uses the pressure for a sudden back-surge to clean the filter. No extra devices are used; the filter shell itself acts as the pressure chamber and the arrangement of regular valving provides the controls. Neither filtered water for cleaning nor back flow pumps are needed. Operating vertically, this tubular filter takes little



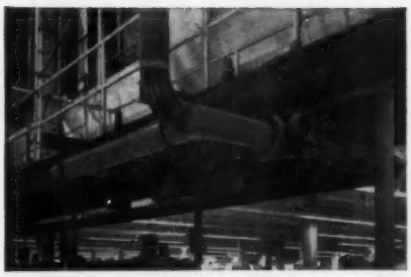
CEMENT: Lubricating a Walworth Lubricated Plug Valve in a West Coast cement plant.

BEVERAGE: A battery of Walworth Bronze Lubricated Plug Valves installed in the blending department of a distillery.

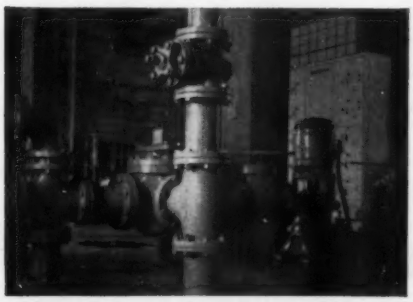
PAINT: Eighteen Walworth Lubricated Plug Valves in a common manifold installation in the varnish division of a midwestern paint and varnish works.

serving almost any industry you can name . . .

WALWORTH LUBRICATED PLUG VALVES



FOOD: Walworth Lubricated Plug Valves are included in the piping arrangement in this large midwestern bakery.



PUBLIC UTILITY: Straight-way and three-way Walworth Lubricated Plug Valves installed in a modern West Coast sewage disposal plant.

At one time Walworth Lubricated Plug Valves were considered a "specialty item". Here are some of the features that have led to their employment in a wide range of industries as high quality 'all-purpose' valves:

(1) There are no threaded stems or complicated seating mechanisms. (2) Because the plug is always seated in the body, solid matter, which might be in the line contents, cannot wedge between the seating surfaces and prevent a tight closure. (3) The position of the wrench handle, or the marking on the plug shank, or the stop collar, clearly indicate the position of the plug. The operator can see from a considerable distance whether the valve is open or closed. (4) Quick opening and closing of the valve is assured by only a quarter turn of the plug. (5) Lubricant can be renewed while the valve is in service.

Walworth manufactures complete lines of Lubricated Plug Valves in a variety of types and materials for working pressures up to 5000 psi and for vacuum services. Sizes range from ½ to 30 inches.

See your Walworth Distributor or write to Walworth for complete information.

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For Dairies and Food Plants

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Satisfied users say "Cyclotherm Steam and Hot Water Generators will meet your requirements under the most exacting steam demands and rugged operating conditions . . . in a variety of climates and elevations."

Thousands of enthusiastic owners are the finest assurance *any* boiler manufacturer can offer potential customers. Cyclotherm has this assurance and one of the best re-order records in the steam generator industry.

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3. ***Up to 50% savings in maintenance costs.***
4. ***Minimum space requirements*** **. . . Cyclotherm is up to ½ smaller than other packaged units.**
5. ***Reduced installation costs*** **. . . only 5 connections necessary.**
6. ***Factory-trained Service Engineers*** **. . . available weekdays and weekends.**

WRITE TODAY for your free copy of the illustrated, informative booklet with all of the advanced space—time—and cost-saving features of Cyclotherm Steam and Hot Water Generators. Join the thousands of cost-wise, efficiency-minded buyers who order Cyclotherm whenever steam is required.

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CYCLOTHERM
STEAM AND HOT WATER GENERATORS

For more facts circle 616 on Reply Card

NEW PRODUCTS

(Begins on page 138)

floor space, and it is reported to provide filtration at a relatively low price.

In the Hydra-Shoc, influent passes through the walls of perforated tubes covered with synthetic fabrics. The cleaning procedure is simple. The outlet valve is closed, building up pressure on the entrapped air. Then a pair of quick opening valves shut off the inlet and open the drain. The compressed air causes a violent back surge that expands the tube covers, and serves to dislodge the filter cake and force it out the drain. Bulletin 114 describes this filter. Industrial Filter and Pump Mfg. Co.

59—TROLLEY, motor driven for electric hoists

Series 700 Load Lift Trolleys are lightweight, heavy-duty single speed push button controlled units for installation on electrically powered hoists having capacities from 1000 to 12,000 lb. They are available in traverse speeds ranging from 25 to 130 fpm, in models to meet standard voltages. Construction features announced include generous section side plates of non-fracturing rolled steel plate, and full crowned universal traverse wheels with hardened treads designed to operate equally well on wide flange, standard or steep angle I-beams. All models are adjustable to fit a wide range of I-beams to permit relocation of a trolley to another installation having a different size I-beam.

Driving mechanism consists of a 30-min rated squirrel cage, face mounted, totally enclosed motor. A magnetically interlocked 24-v four-button control station is provided to eliminate possibility of damage to the electrical system should both "Up" and "Down" buttons be depressed simultaneously. These trolleys are available as factory installed units in combination with all models of company's Series 700 Load Lifter Electric Hoists or can be purchased separately in kit form. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

60—CONTROL combines photoelectric, timing relays

In this control unit a photoelectric relay is combined with a timing relay, both triggered by the same photoelectric element. The photoelectric relay energizes when the light beam is interrupted, and the timing relay energizes when the timing period elapses while the light beam is interrupted. In one application—conveyor jam-up control combined with

NEW PRODUCTS

(Begins on page 138)

counting—the photoelectric relay actuates the counter; the timing relay operates the conveyor control. Each object that interrupts the light beam is counted. When an object obstructs the light beam beyond the timing period the timing relay stops the conveyor.

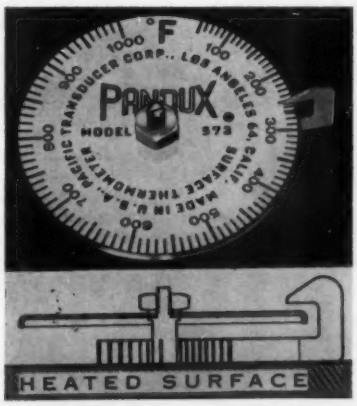
Photoelectric relay contacts are SPDT, rated 5 amp at 115 v a-c, non-inductive load. Timing relay contacts are DPDT, rated 8 amp. Time relay is adjustable over a wide range. Combined controls are mounted in an aluminum case tapped for ½ in. conduit. The unit is furnished for 115/230 v, 50-60 cycles. Lens diameter is 1½ in. Autotrom Co.

61—TERMINAL STRIPS adaptable to various wiring

These terminal strips featuring post-type barriers and studs for attachment of single or multiple terminal ended or looped wires, provide compact light weight units, it is announced, which are adaptable to varying wiring requirements. Strips are available with No. 6 studs in from one through 20 circuits; with No. 8 or 10 studs, to 16 circuits; and with ¼, 5/16 and ⅜ in. studs, to eight circuits. Strips can be supplied of various molding compounds, and with various types of hardware, base cuts, insulating strips, and bus strips as required. Buchanan Electrical Products Corp.

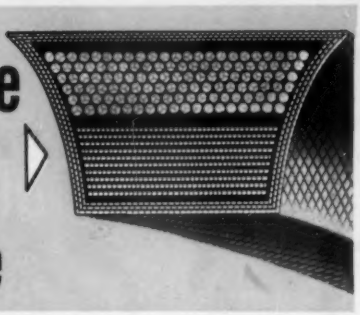
62—THERMOMETER, surface type, is easily read

Model 573, fast-operating, easily-read spot check surface thermometer, is made of stainless steel, with a range of from 50 to 1000 F. It is easy to read, company points out—compact and fast-operating. Merely lay instrument on surface to be



checked—within 60-sec thermometer will reach stability, and temperature can easily be read. It reads temperatures of all surfaces, such as dies, hot plates, heavy sheet metal, furnace skins, boilers, large superheated steam pipes; cooled billets, others. Besides surface temperatures, it reads ambient temperatures in furnaces,

Why this curve lengthens V-belt life



THE CONCAVE SIDES (U.S. Patent 1813698) of every Gates V-Belt are a precisely engineered curve. This curve greatly lengthens V-belt life for this interesting reason:

When you bend a Gates V-Belt, just as it is bent around a sheave, the concave sides (Fig. 1) become straight. Therefore, the belt makes full contact with the sheave, gripping the sides evenly (Fig. 1-A) and wear is distributed uniformly across the sidewalls of the belt. Naturally, uniform wear lengthens belt life; saves on replacement costs and cuts down-time.

Now see what happens when you bend a straight-sided belt. (Fig. 2) Just feel the sidewalls *bulge out* at the bend. The bulge causes *uneven* contact with the pulley, as in Fig. 2-A. And uneven contact causes excessive wear at points shown by arrows; belt life is shortened.

Cut costs by getting longer wear from your V-belt drives. Specify Gates Vulco Rope—the V-belt with concave sides. Your nearby Gates distributor will supply your needs promptly. The Gates Rubber Co.—*World's Largest Maker of V-belts.*

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

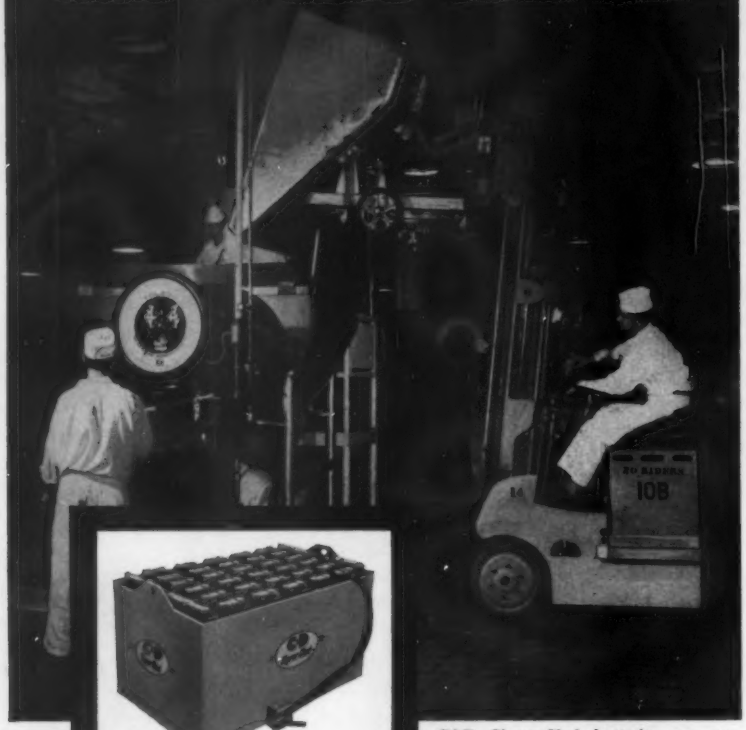
TPA-74

Gates VULCO ROPE Drives

For more facts circle 617 on Reply Card

at

KRAFT FOODS COMPANY



C&D Slyver-Clad batteries are approved as standard equipment by all electrical truck manufacturers.

C&D Batteries for extra work

Kraft Foods Company ranks as one of this well-fed nation's foremost food suppliers. Millions of pounds of food products are handled daily throughout Kraft's many processes. Here, of course, fast and dependable materials handling is a must.

To help guard freshness and quality, Kraft depends on C&D-powered electric industrial trucks. High capacity C&D Slyver-Clad® batteries assure maximum "on the job" service. They pack more power—reserve power—in the same battery space. Thus, Kraft gets more work each day from its C&D-powered trucks.

FOR DETAILS, WRITE FOR CATALOG.

C&D BATTERIES, INC.

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Industrial Batteries since 1906

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SALES AND SERVICE OFFICES IN PRINCIPAL CITIES FROM COAST TO COAST

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NEW PRODUCTS

(Begins on page 138)

ovens and other enclosed spaces; as well as in non-corrosive liquids and gases, up to 1000 F. Thermometer comes calibrated to within ± 2 per cent, it is noted, and can be re-set at any time. Diameter is 1¾ in. overall; weight is ⅓ oz. It is priced at about $3.00. Pacific Transducer Corp.

63—GRINDING WHEEL comes in yellow color

In pastel yellow, this vitrified grinding wheel is claimed to be a cooler cutting and more efficient tool. Manufacturer says the yellow color provides sharper contrast, enabling operators to see the work better, and affords ready recognition in the stock room. Electro Refractories & Abrasives Corp.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 201-202.

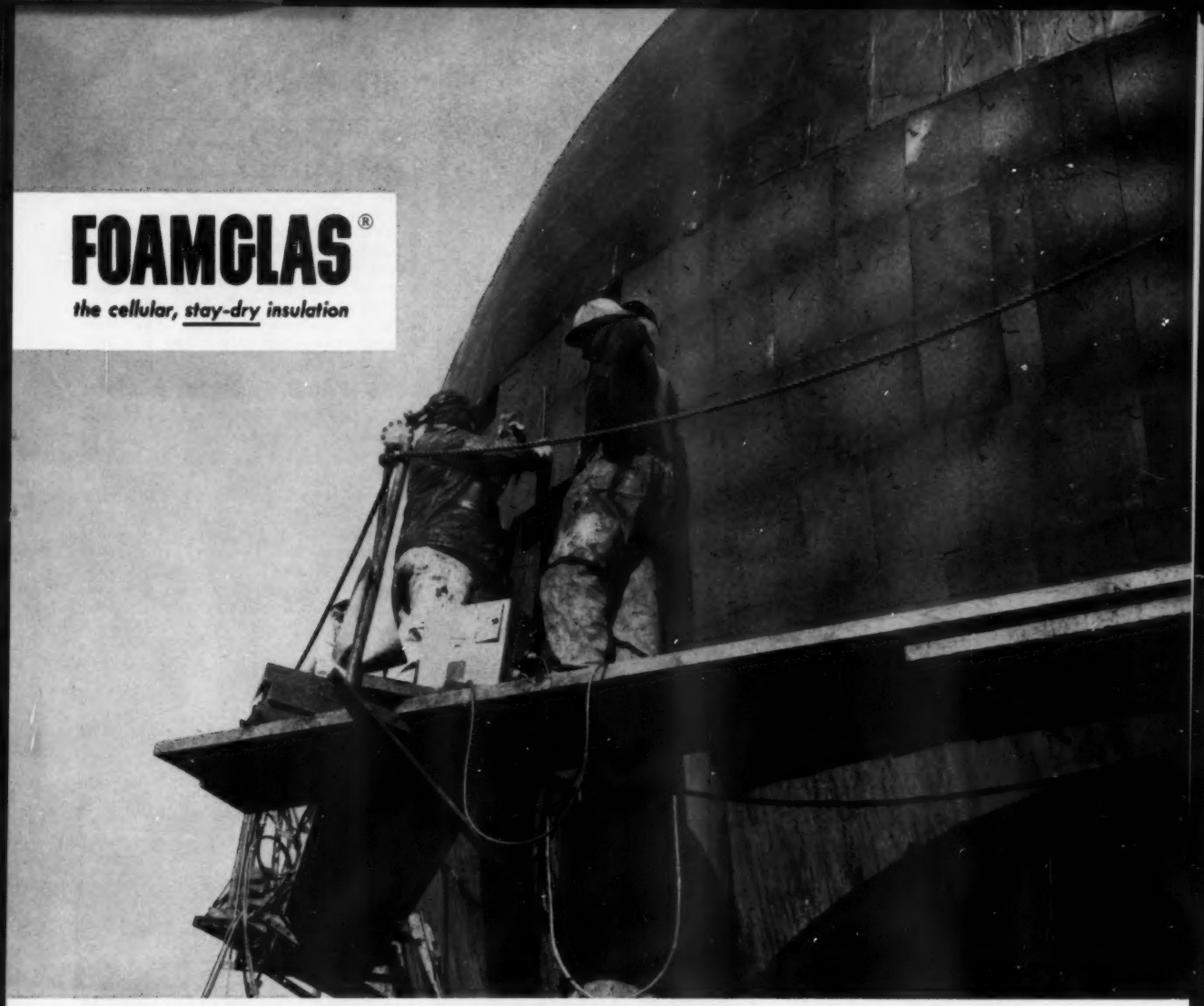
64—INDICATOR-CONTROLLER for low pressure accuracy

Model R-1051 Static Pressure Indicator-Controller is designed to control at a pressure range as low as 0 to 0.2 in. of water. A free floating slack type diaphragm construction is utilized to permit extreme accuracy at this low pressure. It controls dampers and other devices for maintaining static or differential pressures. Controller can be used for pressures above or below atmospheric, or for maintaining a constant differential between two pressures. All instruments are available with calibrated dials for pressure ranges of 0 to 0.2 to 0 to 6.0 in. of water. Bulletin R-1051 gives more details. Johnson Service Co.

65—RECORDERS, graphic-type electronic units

American-Microsen Series 130 Electronic Recorders are designed in graphic style, recording on a 3-in. wide chart while using panel space less than 25 sq in. Both continuous strip charts and IBM card charts are available. Recording is on straight-line coordinates. The recorder measures input signals with an electro-mechanical transducer and amplifier which drives a rotary solenoid to position the pen. A feedback spring from the pen arm to the input transducer force balances the pen position in precise relationship with the input signal. The resulting power is claimed to eliminate pivot friction errors, vibration effects and excessive maintenance.

Recorders are available as microammeters in ranges from 0-200 microamperes to 0-100 milliamperes; and as millivoltmeters in ranges from 0-20 mv to



"FOAMGLAS solved our sphere insulation problem because it stays dry, stays effective"

states U.S. Industrial Chemicals Company

National Distillers Products stores anhydrous ammonia in four 55-ft. diameter spheres at their U. S. Industrial Chemicals Division plant in Tuscola, Ill. Pressure has to be controlled at 55 p.s.i. by holding temperature at 26°F. That calls for insulation that won't lose efficiency, and U.S.I. reports, "We solved the problem with FOAMGLAS."

They explain: "This cellular glass insulation isn't affected by spillage, acid atmospheres or moisture. That means we get dependable temperature control. Even under our blistering summer sun, heat gain in the spheres is only hundreds of B.t.u.'s per hour; not the usual thousands."

FOAMGLAS saved installation time and money for U.S.I., too. They found that "the light, strong, rigid blocks were easy to cut, shape and handle. Best of all, the material's high insulating value made only one 3-in. layer necessary."

These benefits and more can be *yours* when you insulate spheres, piping, equipment or buildings with FOAMGLAS. Prove it yourself with a series of six simple tests easily performed in your own office. Write us today for a free sample and complete testing directions.

Pittsburgh Corning Corporation

Dept. PE-36, One Gateway Center
Pittsburgh 22, Pennsylvania

In Canada: 57 Bloor St. W., Toronto, Ontario

Installing FOAMGLAS on these four U.S.I. spheres was simplified by the material's light weight and handling ease. Each block of insulation was impaled on studs welded to the sphere plates. Joints were then sealed and asphalt cutback was sprayed on as a finish. Insulation Contractor was Heat Lock Corp., Indianapolis, Ind.

For more facts circle 619 on Reply Card

KIRK & BLUM
OVENS
... put the heat on production

... at ALLIS CHALMERS MFG. COMPANY Norwood, Ohio Works

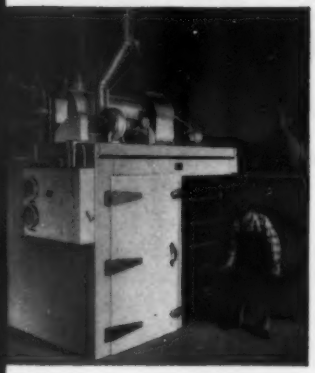
20-ton capacity crane loaded pit-type baking oven.

Shown here are a variety of K & B ovens which are used in electric motor manufacture at Allis-Chalmers Mfg. Company, Norwood, Ohio.

Put the 49 years of experience and skill of Kirk & Blum to work on your industrial oven problems. Write for complete information and "Ovens for Industry" Catalog to The Kirk & Blum Manufacturing Co., 3189 Forrer Street, Cincinnati 9, Ohio.

Turntable commutator curing oven.

Heating Equipment for two batch-type insulation baking ovens.



500°F. batch-type core sand baking oven.

KIRK & BLUM INDUSTRIAL OVENS

For more facts circle 620 on Reply Card

NEW PRODUCTS

(Begins on page 138)

0-100 v with input sensitivity to 6700 ohms per volt. Accuracy is given as within 0.5 per cent of range, and repeatability as better than 0.25 per cent. The recorders are designed to respond to input changes of less than 0.2 per cent of range. They can be furnished with single high or low, or high and low alarm contacts. Industrial Controls Div., Manning, Maxwell & Moore, Inc.

66—PAINT STICK for products subject to acids, alkalis

The D-A Paintstik is announced for marking metals and lumber subject to steam conditions, cleaning solutions or grease cutting solvents, acids and alkalis. Manufacturer says that marks made with this paint stick will withstand indefinite immersion in a mill pond, temperatures to 500 F, pickling bath solutions, and abrasive conditions of coke, sand and coal dust. On steel and iron as well as non-ferrous metals, it will withstand pickling, it is claimed. D-A Paintstiks come in red, white, blue, green, yellow and black. Markal Co.

67—HYDRAULIC PULLER for heavy maintenance

This new 50 ton hydraulic puller set provides heavy duty pulling power for maintenance work on large industrial machine tools, turbines, industrial tractors, mining machinery, earth moving and other heavy

equipment. The set includes all the basic items to remove and install gears, bearings, pulleys, sheaves, pinions, sprockets and other tight fitting parts. The set is available with either electric or hand operated pump. Pulling with hydraulic power is accomplished without distortion to parts while the remote application of hydraulic power serves to eliminate danger to personnel working on the job. Owatonna Tool Co.

68—A-C MOTOR, self contained, adjustable speed

Completely self-contained, these adjustable speed a-c motors apply the Schrage principle for stepless speed control from zero to 2400 rpm, with torque approximately constant at all speeds. They need no external devices to vary speed, it is noted, and ratings range from ½ to 75

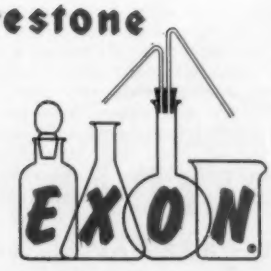
EXON: each resin engineered for a specific problem

EXON solution resins

varying in properties to suit specific needs

Your needs are the blueprints of Firestone engineers. There are several distinctly different Exon solution resins to solve industry's varied problems regarding application, purpose, performance conditions and surfaces. The significance is this: if you require a solution resin specifically engineered to fit your particular set of problems, you're likely to find it in the growing line of Firestone Exon resins. For example:

Firestone



EXON 450 Good solubility, film tensile strength and durability allow formulations to be based on this one resin alone. Coatings can be spray-applied, and strip off cleanly and easily.

EXON 461 Fluorinated, non-flammable, thermoplastic. Soluble in aromatic, ketone and ester type solvents. Films adhere to porous substrates, show excellent heat and light stability, exceptionally low vapor transmission, good resistance to inorganic chemicals including concentrated acids and alkalies.

EXON 470 Excellent adhesion to metals, alkyd and vinyl surfaces. Compatible with various drying oils, alkyds, phenolics and melamines. Highly soluble in ketone solvents. Good aromatic tolerance.

EXON 471 has excellent solubility. Unmatched as a protective coating. Corrosion resistant, adheres to vinyl, paper and cloth. Will adhere to wash primer. Common lacquer techniques can be used in application of coatings. Numerous solvent systems are possible, permitting use in a wide variety of applications.

For complete details on these and all other Firestone Exon resins, write:

CHEMICAL SALES DIVISION
FIRESTONE PLASTICS COMPANY, POTTSTOWN, PA., DEPT. 615E
DIVISION OF THE FIRESTONE TIRE & RUBBER CO.

For more facts circle 621 on Reply Card

For more facts circle 622 on Reply Card

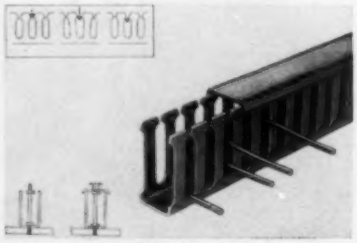
NEW PRODUCTS

(Begins on page 138)

hp, for 220-v or 440-v 60-cycle, three-phase power supply. Enclosures are drip-proof or pipe ventilated. A large radial fan draws air in at the front, circulates it through the motor, and expels it at the drive end to avoid recirculation. Efficiency is claimed high at all speeds. ACEC Electric Corp.

69—PANEL CONDUIT reduces wiring time

Featuring a slot design said to cut wiring time to a minimum, Panduit Plastic Wiring Duct is available in a wide range of sizes, the largest being 3-by-3 in.-by 5 ft. The slot design introduces a simplified method of inserting and removing



wires, in that the wires are merely snapped in and out of the duct. It also permits attachment of lugs before the wire is inserted and lets the wire be removed with lugs attached.

The Panduit fastener, is also announced as new, in that it holds both duct and cover and prevents either from slipping. Being an internal nut and bolt arrangement, it has no external projections, company explains; it does not require space adjacent to the duct and does not interfere with wire insertion, threading of wires under fasteners is eliminated. Low in initial cost, the wiring duct is highly insulating, says manufacturer, and it won't warp. Duct and cover are finished in black. Panduit Co.

70—SLIDE RULE is green-yellow easy on the eyes

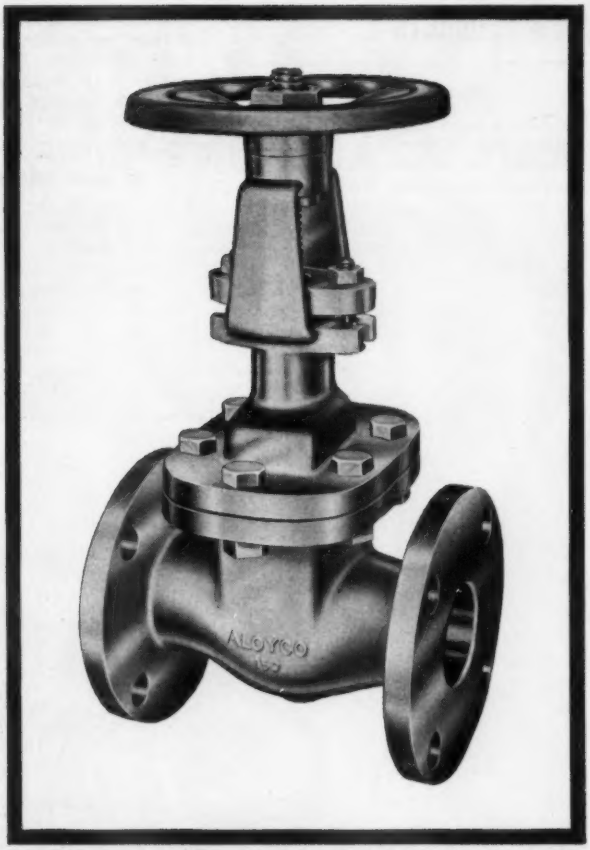
This light alloy slide rule is made in a green-yellow color to eliminate the violet and red rays which focus in front of and behind the retina. According to manufacturer, this green-yellow shade coincides with optimum sight point of the spectrum, and reduces eyestrain, blurring and errors in reading calibrations. Six- and 10-in. trig, log-log standard rules are available, and special rules may be ordered. Pickett & Eckel, Inc.

71—TIMER VALVES control flow automatically

Flow of liquids, gas, or air can be controlled automatically with these timer valves, it is announced. The units consist of a solenoid valve and a timer control

Are your valves over their heads in corrosive reducing solutions?

Switch to Aloyco Monel or Nickel Valves!



ALOYCO MONEL VALVES are used extensively in handling alkalies, salt waters, food products, organic substances, and many air-free acids.

Keeping corrosive solutions of mineral and organic acids, alkalies and salts under control is a job for Aloyco Monel or Nickel valves.

Monel valves are especially good for handling hydrofluoric acid which is used as a catalyst in one process for the production of high octane gasoline. Monel and Nickel have exceptional resistance to neutral and alkaline salt solutions, including chlorides, carbonates, sulfates, nitrates and others. Nickel is more resistant than Monel to more concentrated NaOH solutions at elevated temperatures and is usually preferred when contamination of the caustic with copper or iron would be objectionable.

Nickel, although similar to Monel in corrosion resistance, has generally an inferior resistance to acids, about the same resistance to salts and a little better resistance to alkalies.

Both alloys are available in a wide range of Aloyco valve designs. They're cast by induction melting at Aloyco foundries and machined in Aloyco plants. New bulletin #9, couponed below, provides complete information. Write today to ALLOY STEEL PRODUCTS CO., INC., Linden, N. J.

5.7

Alloy Steel Products Company, Inc.
1308 West Elizabeth Avenue
Linden, New Jersey

Gentlemen:

Please send me a free copy of your Bulletin No. 9 on Monel and Nickel valves.

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

For more facts circle 623 on Reply Card

NEW PRODUCTS

(Begins on page 138)

sealed in a water-tight case.

They turn the flow on or off at desired time intervals. Units are available in a variety of timing cycles, they have a number of industrial applications. For example, says company, they can be used to turn a flow either on or off, or both on and then off, at any desired time. They can perform this function each day with repeat cycle operation—no re-setting is needed. The timer valves can also be used to obtain continuously intermittent operation—that is, they can be set to open and close a valve a certain number of times per minute, hour, or day. The valves fit standard pipes ⅜ in. and larger; operate on 110 or 220 v, 60 cycle current. Automatic Controls Corp.

72—PIPE BENDER makes bends in one setting

Bends up to 90 deg can be made in one setting of the pipe and one stroke of the ram with the S-130 "One-Set" Hydraulic Pipe Bender, it is announced. The S-130 has a bending frame, swivel and bending shoes of rigid, lightweight aluminum. It has a removable top plate for permitting easy setting of the shoes and positioning of the pipe for bending. By removing the top plate, pipe can be simply inserted from the top and the bending job accomplished. This feature is particularly advantageous when work must be done in congested areas. The bender is designed to work in any position—on the floor, on a table, overhead, or on existing runs.

Featured in the unit is company's Optik Angle Gage, which lets the operator

have visual control of the bend with every pump stroke. This speeds making 180-deg bends, double offsets, compound and repeat bends, it is noted, and no tables, calculations or measurements are required. When mounted to a swivel shoe, this gage becomes an integral part of the bender. Readings from 0 to 105 deg are visible either through holes in frame or on exterior of bender.

Six cast aluminum bending shoes handle ½- to 2-in. diam pipe or conduit. A remote-controlled hydraulic power unit gives the bender portability and can be used separately as a maintenance jack. Operating speed of the bender contributes to the economy of the unit. Sold as a set, the S-130 is packed in a wooden case. Blackhawk Mfg. Co.

73—ADHESIVE for bonding metal, other surfaces

Resiweld is claimed to permanently bond aluminum, steel, zinc, copper, brass, iron, glass, wood, rubber and plastic surfaces to themselves and to each other. The bonds formed are said to combine high structural strength with excellent impact resistance. Resiweld has remarkable resistance to solvents, grease, water and chemicals, it is announced, as well as the ability to withstand severe conditions of treatment and exposure. It is suggested for manufacturing, assembling, laminating and repairing. A trial kit for testing costs around $1.00. H. B. Fuller Co.

74—THERMOSTAT for hot water heater control

Accelerated life tests are reported to show that the Clostemp Thermostat can maintain water temperature to within 3 F of original calibration even after 50,000 operations—about 20 years of actual service life. For quick response to tank wall temperature change, the bimetal assembly has been placed on the outside of the thermostat back plate. Contacts and other current carrying parts are protected within an aluminum and molded phenolic case, 2⅜ by 2⅞ by 1⅛ in. in size. Other features include a re-

Drying oven with silhouette plates removed to show interior of oven. Baking oven is directly behind the instrument panel cabinet.

In order to meet the increased demand for its products, a prominent fan and blower company recently renovized its metal products finishing department.

The company installed two Sly Convectioneered Ovens: (1) a water dry-off oven — 24'-8" long, 9' wide, 8' high — to remove the moisture from the parts after leaving the washer and (2) a paint baking oven — 64'-8" long, 9' wide, 8' high — located adjacent to the dry-off oven.

Both ovens have the same basic design and differ only in length and heater capacity.

Automatic temperature and safety controls are part of the air heater equipment and protect the systems against flame, fuel, power, or mechanical failure. Actual runs show that from a room temperature of 70° F. a temperature of 350° F. is achieved in 12 minutes and maintained uniformly. Both drying and baking ovens are set up for 8-minute cycles.

Results of this installation: production materially increased and better finishes obtained, at very substantial savings! *May we discuss your requirements with you?*

Designers and Manufacturers of Dust Control Systems—Blast Cleaning Equipment — Tumbling Mills — Industrial Ovens.

THE W. W. SLY MANUFACTURING CO.
SINCE 1876
4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

For more facts circle 624 on Reply Card

6 STAR FEATURES

years ahead!

A VERTICAL SPLIT CASE PUMP

B & G SERIES 1510

TYPE B CENTRIFUGAL PUMP

. . . with balanced loading of impeller and bearings . . . handles loads far in excess of those produced by any pump and motor combination! Easily serviced without breaking pipe connections!

1. **Leak-proof Mechanical Seal.** Features the exclusive, harder-than-glass B & G "Remite" insert. This Seal construction has enabled nearly two million B & G Pumps to make an amazing record for failure-proof performance.

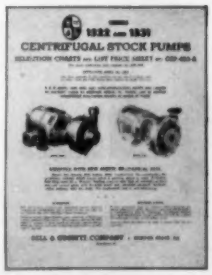
2. **Balanced Impeller.** All pump impellers are statically balanced and hydraulically balanced where required. Balancing chamber and pressure relief holes reduce thrust to a minimum.

3. **Solid-type Volute with Support Foot.** Can be left in pipe line when servicing pump —rugged construction absorbs piping strains.

4. **Removable Bearing Frame.** Complete bearing frame, including seal and impeller, can be removed without disturbing piping or motor leads. The bearing frame is replaceable and interchangeable on all sizes.

5. **Anti-Friction Roller Bearings.** Timken Bearings handle thrust and radial loads for smoother, quieter, more efficient operation.

6. **Oil Lubrication.** No messy, undependable grease cups—circulating oil lubrication assures positive protection to bearings. Oil level indicator permits visual check.



STOCK PUMPS!

Selected sizes of B & G Series 1522 and 1531 Centrifugal Pumps are stocked at the factory for immediate shipment. Capacities to 225 GPM, heads to 140 ft. Send for Price and Selection Catalog.

BELL & GOSSETT

COMPANY

Dept. EG-53, Morton Grove, Ill.

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto, Canada

For more facts circle 625 on Reply Card

NEW PRODUCTS

(Begins on page 138)

flective dial plus positive dial stops to prevent setting above a safe limit. Temperature range is adjustable from 120 to 170 F. Westinghouse Electric Corp.

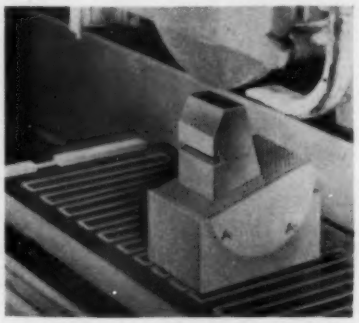
75—DIAL SCALES cut down on human errors

Floaxial Cabinet Dial Scales are engineered to assure exactness of weight. They are intended to eliminate possible human errors and provide precision performance despite rugged operating conditions. Greater ease and simplicity of operation have, it is said, also been built into these new dial scales. Four new features are incorporated in Floaxial cabinet dial design: a direct reading dial, a full swivel head, a cage-type central column construction and a controlled-speed dash pot.

The direct reading dial makes it possible for the weighman to utilize drop weights and still read the total new weight at the tip of the dial indicator. This feature not only speeds up weighing but eliminates many errors since it does away with the need for a weighman to add the weight he obtains from a drop weight window to a second weight shown at the tip of a dial indicator. The net weight is totaled for him at the indicator tip. Fairbanks, Morse & Co.

76—MAGNETIC WORKHOLDER is easily maintained

Described as ideal for use on any machine equipped with a magnetic chuck, this adjustable magnetic workholder is constructed of alternating laminations of brass and iron, possessing high permeability and low residual magnetism. The



laminations are held without pins or rivets, it is noted.

This adjustable holding block has a flat ground face (upon which the work is secured) which is rotated by hand to the required angle. The angle is quickly and easily set with the aid of a protractor and planer gage. For future reference, the position setting need only be recorded from the planer gage reading. This height setting may be varied in small angle increments to assure the accuracy necessary for precision machining. Maintenance is simple, as the mere removal of the rotating block exposes bearing surfaces. Anton Machine Works.

Use the Reader Service Cards provided on pages 201-202 to ask for more information on these products. Circle item numbers of products in which you are interested.

77—CHART DRIVE is pneumatically operated

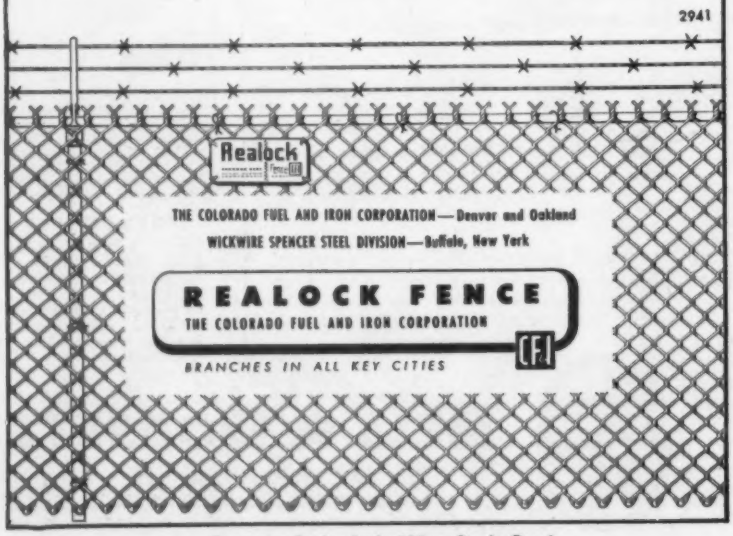
This compact, pneumatically operated chart drive assembly is designed for positioning recorder charts at distances up to 250 ft. Optional equipment for the firm's Tel-O-Set line of recording instruments, the assembly comprises a master pulse transmitter and a receiver. Timing is controlled by a synchronous electric motor in the transmitter. It is explosion proof, manufacturer points out, and both units are sealed against dirt and dust. The receiver is in the recorder and the transmitting unit in the back of the control panel. The new assembly can handle 57 recorders at distances of 100 ft or

REALOCK FENCE *means*

NO TRESPASSING!

For institutional and industrial plants, Realock Fence and Gates help prevent trespassing, burglary, arson and vandalism—with minimum patrol requirements.

Furnished with barbed or knuckled selvages. Galvanized after weaving for complete corrosion protection. Supplied in several types and all standard heights up to 12'.



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FORD ASSEMBLY PLANT
San Jose, California

45 acres of fixtures at new Ford plant maintained at lower cost with UP-RIGHT aluminum scaffold-on-wheels

17 FT. SCAFFOLD ASSEMBLED IN 2 MINUTES BY 2 MEN

You, too, can save with these rapidly assembled Up-Right aluminum scaffolds.
Write for circular • Up-Right Scaffolds • Dept. 163 • 1013 Pardee St., Berkeley, Calif.

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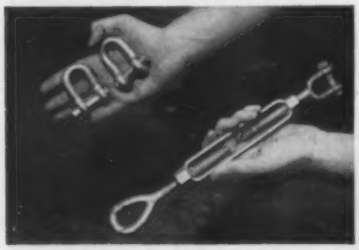
"SAFELY DOES IT" AT DESOTO PLANT

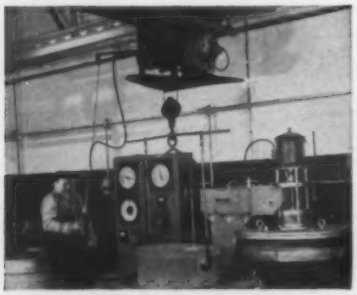
In the automotive industry, as in manufacturing plants across the nation, the emphasis is always on safety. In the mammoth DeSoto Plant, a car body, above, moves smoothly and efficiently along the assembly line secured *safely* to the body-drop hoist with 28 Crosby Clips. Everywhere, workmen recognize and know they can depend on the clip with the Red-U-Bolt—genuine *safe* Crosby Clips. Today, Crosby Clips safeguard more men and equipment than any other drop-forged wire rope fasteners.

Blocks. Workmen know that the Crosby Block they're using is right for the job, and that valuable equipment is protected because the safe working capacity is *embossed right on the side-plates*. Load-Rated Crosby Blocks and genuine Crosby Clips are products of the Crosby Division, American Hoist & Derrick Co., St. Paul 1, Minnesota.



EXCLUSIVE TURNBUCKLE EYE INCREASES USEFULNESS

A pear-shaped turnbuckle eye designed to take the ear of a shackle one size smaller, as well as the standard shackle, is another exclusive product developed for efficiency in industry by the Thomas Laughlin Division of American Hoist & Derrick Co. Industrial users report that Laughlin's exclusive double-duty eye not only rates the approval of workmen, but also helps cut their turnbuckle inventory.



MEN, EQUIPMENT PROTECTED

A positive means of avoiding accidents due to overloaded blocks is provided industry by Load-Rated Crosby

CUTS HOIST ACCIDENTS

To help eliminate the major cause of hoist accidents—loads slipping or jarring off the hook—safety-conscious industrial users in plant after plant are switching to Laughlin Safety Hooks. A powerful snap-spring latch on drop-forged Laughlin Safety Hooks guarantees that loads cannot be jarred from the hook and prevents overloading with too many lines. Laughlin Safety Hooks are part of the famous Laughlin line—the world's most complete line of fittings for wire rope and chain. For complete catalog, write: Thomas Laughlin Division, American Hoist & Derrick Co., St. Paul 1, Minnesota, or Portland, Maine.

For more facts circle 628 on Reply Card

NEW PRODUCTS

(Begins on page 138)

35 instruments at 250 ft or less. The electric motor in the transmitting unit operates on 115 v, and comes in either 50- or 60-cycle models. Minneapolis-Honeywell Regulator Co.

78—STORAGE RACKS from "do-it-yourself" school

The Sturdi-Bilt, an adjustable rack, can be used interchangeably for pallets, skids, dies or bulk, or for combinations of stored materials, according to the needs of the user. It is assembled without bolts, nuts, erection welding or special labor, and is especially valuable for firms whose needs

include rapid expansion of storage facilities and/or storage facilities that can quickly be dismantled or adjusted where necessary. One rack can be used to serve all storage needs without structural changes, since parts are interchangeable, with all parts reusable at all times. This will completely eliminate special rack installations, and will permit standardization of one storage system throughout the entire plant. Racks can be loaded from either side.

Sturdi-Bilt Racks are composed of only three basic parts—upright frame, support beam, and floating wedge lock, a revolutionary new piece which is primarily responsible for the ease and rapidity with which the rack can be assembled and rearranged. Supplementary parts permit multiple rack uses. These component parts are joined by an entirely new principle which tends to increase the rigidity of the entire rack when loading is increased. Sturdi-Bilt Steel Products, Inc.

79—TOILET TANK FLOAT made for long service

Made of a material claimed unaffected by alkali, sulfur and other water impurities, this toilet tank float is reported to last as long as the tank itself. Manufacturer says it is impossible to puncture or break it when installing or adjusting the float rod. A reinforced metal spud and wide band around the center provide extra strength against breakage. To guard against leakage at the seam, the float is sealed by a fluxing process. Be-

NEW PRODUCTS

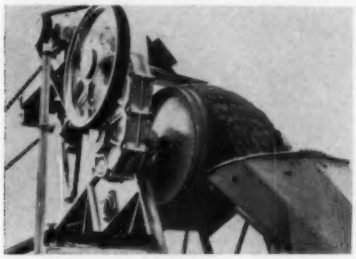
(Begins on page 138)

cause of its lighter weight and greater air capacity, this float is said to have greater buoyancy than most larger size floats, but it fits even small tanks. J. A. Sexauer Mfg. Co.

80—SPEED REDUCERS for use on the big jobs

With the recent addition of two models to its Torque-Arm line, this manufacturer now offers shaft-mounted speed reducers, with capacities from 1 to 60 hp and output speeds from 12 to 365 rpm. These represent an increase of 40 per cent in maximum rated horsepower capacity.

The new size No. 8, in the double reduction series, extends all the advantages



of shaft mounting to big jobs. The No. 8 has a capacity of 60 hp at 100 rpm, AGMA rating, and can be mounted on shafts up to 5 in. diam. At the other end of the line is the new No. 11, with a capacity of 1.3 hp at 100 rpm.

No foundation, no flexible couplings, no sliding base are required for any of these reducers, and there are no lining up difficulties, it is pointed out. The reducers are mounted directly on the shaft, and the Torque-Arm is fastened to any fixed object, anchoring the reducer. The unit is driven through a V-belt drive. Taper-Lock Sheaves permit any speed ratio desired.

The overload release which loosens the belts, cuts off power and gives a warning in case of excessive load is available for use with any Torque-Arm Reducer. A built-in backstop may also be provided when conditions require a device to prevent the reversal of the direction of rotation. Dodge Mfg. Corp.

81—TRUCK LOADER operates hydraulically

Operating as a complete unit with one man and one machine, this hydraulic truck loader—the LoDaL—is announced for a wide variety of industrial uses. With a 3000-lb capacity, it loads one truck or many, has very fast action that permits loading speeds up to two yards per minute in heavy material, and fits most trucks from 1½ to 4 tons capacity, with special models for trucks over 4 tons. Truck loads itself and in addition, the forward tilting bucket provides for loading other trucks. One LoDaL can do the job of many specialized machines, it is said, for such operations as loading sand or gravel, high-speed snow removal and ice control. Lodal, Inc.

82—HOIST HOOKS designed for safety, long service

Safety Hoist Hooks feature rugged latches with powerful non-corrosive snap-springs, says manufacturer; loads cannot be jarred from the hooks. The design is such that maximum throat opening is available. Latches are of sufficient size, for each hook, to allow the operator ample gripping area so that fingers will not be exposed to the load carrying line. This new line of hoist hooks is heat-treated after forging for strength and toughness. The hooks come in both shank and eye patterns in a range of "safe working load" capacities from 1200 lb to 30 tons. J. H. Williams & Co.

83—MAGNETIC UNIT for use with belt conveyors

You can convert existing or new belt conveyors to permanent, non-electric magnetic conveyors by the addition of Magna-Rails, it is announced; with them, nails, cans, ferrous metal parts and scraps can be moved up inclines 75 to 80 deg. The Magna-Rail is a circuit of Alnico V magnetic castings, 4-in. wide,

ROTATING AIR CYLINDERS
HYDRAULIC AND AIR VALVES
specify . . . Logan
LOGANSQUARE AIR CYLINDERS
NONROTATING AIR CYLINDERS
YOUR DEPENDABLE "ONE-SOURCE" SUPPLIER FOR ALL YOUR AIR AND HYDRAULIC EQUIPMENT . . .
✓ One-manufacturer responsibility
✓ One-source manufacturing
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HYDRAULIC AND AIR PRESSES
AIR-DRAULIC CYLINDER
SURE-FLOW COOLANT PUMPS
MEMBER: Natl. Mach. Tool Builders' Assn., Natl. Fluid Power Assn.
ROTOCAST HYDRAULIC CYLINDERS
AIR-OPERATED VISES AND FIXTURES
AIR AND HYDRAULIC OPERATED CHUCKS
HYDRAULIC POWER UNITS
PROPERLY DESIGNED . . . PROPERLY EQUIPPED BY
Logan YOUR DEPENDABLE "SINGLE SOURCE" For All AIR or HYDRAULIC Equipment
RETURN THIS COUPON FOR FREE ENGINEERING DATA
LOGANSPORT MACHINE CO., INC.
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PLEASE SEND COPY OF CATALOG:
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☐ 100-4 AIR VALVES
☐ 100-5 LOGANSQUARE CYLINDERS
☐ 100-5-1 ULTRAMATION CYLINDERS
☐ 51 PRESSES
☐ FACTS OF LIFE
☐ 47 SURE-FLOW PUMPS
☐ 200-1 HYD POWER UNITS
☐ 200-2 ROTOCAST HYD. CYLINDERS
☐ 200-3 750 SERIES HYD. CYLINDERS
☐ 200-4 HYD VALVES
☐ 200-5 FITTINGS
☐ 70-1 CHUCKS
☐ ABC BOOKLET
☐ CIRCUIT RIDER
TO:
NAME TITLE
COMPANY
ADDRESS

For more facts circle 629 on Reply Card

NEW PRODUCTS

(Begins on page 138)

1⅛-in. high, available in standard lengths of 3 to 6 ft, or in special sizes. By placing the needed lengths under the conveyor belt, you convert it to a magnetic conveyor or elevator system.

Magna-Rails come in two magnetic strengths. Model MCR-3112 is for average ferrous objects of medium size—can covers, caps, small stampings—at speeds to 85 fpm. Model MCR-316 is for handling, at greater speeds, more difficult materials, unusually shaped objects, where contact with the belt is small, where non-magnetic compounds are involved, and on tangled masses or objects. Eriez Mfg. Co.

84—BONDING AGENT for resurfacing concrete floors

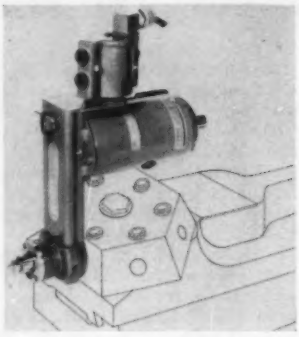
Scarification can often be eliminated when resurfacing old concrete or brick floors by using Emeri-Bond, says manufacturer of this bonding material. If the old floor level can be raised as little as ¼ in., Emeri-Bond can be applied directly to the cleaned floor to bond a new surface of Emeri-Crete Flooring to the old concrete or brick, it is noted. Emeri-Bond can also be used to bond new flooring to scarified base slab.

A unit of Emeri-Bond consists of a 40-lb bag of powder and a gallon of paste—enough to cover 100 sq ft, 1/16-in. thick. Company recommends Emeri-Bond where the condition of the base concrete calls for a special bonding material, but points out that it will not compensate for structural weakness and should not be used on deteriorated concrete. In use, the fluid Emeri-Bond mix is scrubbed onto the previously cleaned, dry floor surface with a broom or brush to provide a thin coating, leaving no bare spots. Normal drying time is around 2 hr.

A new surface of company's Emeri-Crete Flooring (a Cortland emery aggregate) can be applied in two ways. In the monolithic method, in which no cement or water slurry is required, Emeri-Crete is applied immediately before the Emeri-Bond sets. In the granolithic method, the Emeri-Bond is allowed to set. Then this surface is scrubbed with a cement and water slurry and the Emeri-Crete mix put down. Walter Maguire Co., Inc.

85—DRILLING ATTACHMENT for small turret lathes

Tru-Hole Model 25 Speedy Drilling Attachment is designed for use on small turret lathes of the Hardinge, Rivett, South Bend, etc. class. Indications are that the Model 25 will be valuable where



fast drilling of true, deep holes is a problem. Other advantages claimed for this drilling attachment are: tool breakage is reduced to a minimum; production is stepped up; and closer tolerances are held. The variable motor speed is designed to permit drilling of holes as small as an 80 drill and up to and including 5/32 in. in any kind of material.

This unit is supplied with an electrical slip ring connector which permits fast indexing of the turret without entangling the cord. Only one turret station is occupied by attachment. E. F. Vilter Co.

86—DUST-FUME COLLECTORS floor type and cone type

These wet-type dust-fume collector units have a cone and baffle design which is said to result in a "cyclonic" washing action. This, in turn, creates a turbulence which separates the wet dust and carries it to a sludge tank for removal. In detail, the action produced is this:—water, supplied by a direct driven pump,

"Doc, dermatitis control is simple as 1-2-3-4-5."

An exaggeration?

Not at all. Occupational skin irritation can be prevented. Simply. At surprisingly little cost.

—with the WEST Dermatitis Prevention and Control Program that:

1—insures personal cleanliness
2—protects exposed skin areas
3—prevents clothing contamination
4—guards against special hazards
5—provides continuous consultation.

WORKERS free of skin irritation can save you hundreds, perhaps thousands, of dollars each year—by eliminating the cost of:

—medical treatment
—enforced idleness
—absenteeism
—sacrificed quality
—lowered morale
—production lags.

THE WEST Program for controlling skin irritations is based on individual shop requirements and an in-your-shop survey, made without obligation. Let a WEST representative plan the details.

OLDEST AND LARGEST COMPANY OF ITS KIND IN THE WORLD

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Use your business letterhead to request our 24 page booklet "The Control of Dermatitis in Industry."

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IT'S A WISE ENGINEER...WHO SPECIFIES DeLuxe

You can save 50% of your INSTALLATION EXPENSE

ONE GOOD REASON WHY YOU SHOULD CONSIDER DeLuxe

DeLuxe features "bin type" one-piece uprights . . . made with I-beam construction for strength. It's so easy to install, no panels to bolt . . . three conventional pieces "molded" in one!

WRITE FOR OUR FREE 48-PAGE SPECIFICATION CATALOG NO. 29. YOU ARE NOT OBLIGATED WHEN YOU USE OUR "PLANT LAYOUT SERVICE." THERE IS A DeLuxe FACTORY TRAINED REPRESENTATIVE AS NEAR TO YOU AS YOUR TELEPHONE.

It's wise to specify DeLuxe Careful selection of shelving now . . . will save you set-up headaches and extra expense later. DeLuxe shelving is fully finished . . . no rough edges . . . our special components make it possible to assemble in half the time . . . heavy gauge materials are used throughout . . . it's versatile . . . for any plant requirement. When you spell out "DeLuxe" on your proposed plant layout . . . you've protected your shelving investment for all time.

DELUXE METAL FURNITURE COMPANY

399 Struthers Street, Warren, Pa.

A DIVISION OF THE ROYAL METAL MFG. CO.

Manufacturers of "Verti-File", "Templa-File", and quality factory furniture.

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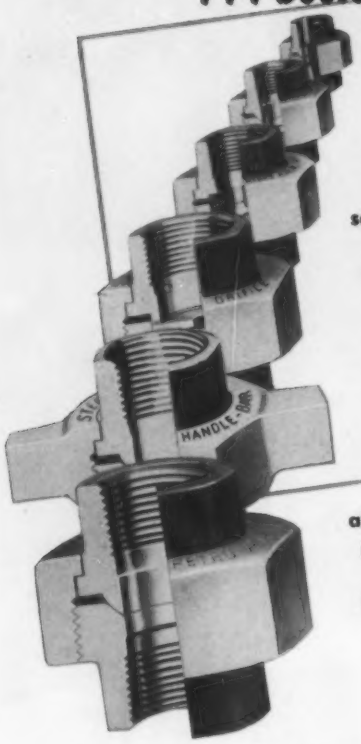
PIONEERING in PIPING PROBLEMS

Since 1912
CLAYTON MARK & COMPANY
has designed the BEST in UNIONS . . .
. . . Doors to the Pipeline



Way back in 1912 Clayton Mark & Company realized industry's great need for a steel union capable of withstanding high temperatures, high pressure and severe wrench abuse. A sturdy union that would again and again make and break with ease and still perform dependably in service.

They also realized that a door to the pipeline which could be opened quickly and closed tightly would become an important factor in reducing production losses and maintenance costs.

This pioneering has brought about many Mark Firsts in steel union products. All have been specifically designed to solve definite piping problems and are produced to meet the highest standards of quality.

Truly America's First and Finest Steel Unions.

FIRST UNIONS to have a differential in hardness (Brinell) between the male and female seats to prevent gauling.

FIRST UNIONS to Rust-Proof, Spark-Proof and Permanently Lubricate the nut threads with Udylite Cadmium.

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FIRST FORGED STEEL HANDLE-BAR UNIONS Including the 4000 and 6000 TEST HANDLE-BAR and the HANDLE-BAR "O" RING.

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NEW PRODUCTS

(Begins on page 138)

cascades downward within the collector. This action results in a series of closely related water curtains through which the dust and fume-laden air is filtered in its upward travel. The dust and fume laden air is in continuous fluid contact during the upward flow. A double row of moisture eliminators are mounted above the washing chamber. Access doors are provided in the housing for the inspection of eliminators and wash chamber.

Flat bottoms incorporated in the design serve as settling tanks from which the water is recirculated. A chute type of cleanout is provided for simple hand cleaning of settling tank. These wet type dust-fume collectors are also produced with flight conveyors for automatic ejection of sludge from tanks to containers. Bulletin 1155-A gives data. The Zack Co.

87—VAPOR CONDENSER is self-contained system

In the Aero Vapor Condenser, cooling is done by the evaporation of moisture on the surface of tubes through which the vapors pass. Installed on the top of a stripping column or above a vacuum kettle, the apparatus forms a self-contained condensing system. Heat is rejected from the coil surface directly to the outdoor air in a fan-induced air stream. Water sprayed over the coils is recirculated and the only water service required is for make-up. Non-condensible gases are separated from the condensate by a baffle tube within the manifold into which the condensed liquid drains, and all condensate is recovered.

Non-condensibles are ejected by a steam ejector nozzle or vacuum pump. Before ejection they are sub-cooled; thus, it is explained, the major portion of vapor mixed with such gases is condensed and returned through reflux tubes. Volume and weight of the non-condensible mixture ejected is therefore minimized. Condensing temperatures within 20 deg of atmospheric wet-bulb temperature are declared practical. A high vacuum can be economically maintained, it is pointed out. Niagara Blower Co.

88—POWER RECTIFIER operates up to 200 C

Development of a silicon power rectifier capable of operating at ambient temperatures to 200 C is announced. This rectifier, designated the NS-P1 is housed in a rugged, shock- and vibration-proof plated case approximately 1⅛ in. diam and 1¼ in. high. Maximum reverse working voltage is 60 v and minimum Zener (breakdown) voltage is 70 v. Forward current density at 1 v drop is in excess of 600 amp per sq in. of junction area. Intended to replace larger selenium rectifiers, this silicon rectifier provides high power handling ability and reliability at higher temperatures, it is noted. Hoffman Electronics Corp.

INDUSTRIAL FILMS

Threaded Fastenings

DEVELOPMENT and application of threaded fastenings from their earliest use in Greek and Roman times up to the present is shown in "The Allen Story," a 25-minute long color film. Early manufacturing methods, and how these have been refined into today's high precision threading, are demonstrated.

Concentrating on hex-socket set screws, cap screws, and other hex-socket fasteners, the film makes a brief tour that highlights the manufacturing processes in an up-to-date, well equipped hex-socket screw plant. The modern, cold-drawing process is featured, showing how this forming method preserves the fibers of steel uncut throughout the screw.

A large portion of the film is devoted to specific applications of socket screws to a variety of products, running from large machine tools to miniature precision devices. Applications are shown in detail, and the film will have many practical suggestions which any viewer can apply to fastening problems in connection with his own products.

Film is available on free loan from Advertising Department, The Allen Manufacturing Company, Hartford 2, Connecticut.

Engineering Timber

ELEMENTS of timber engineering are demonstrated in a new 16mm, sound-color film, "Engineered Timber Construction."

Semi-technical, the film is designed for classroom use in architectural and engineering colleges, and for meetings of architects, engineers, and builders.

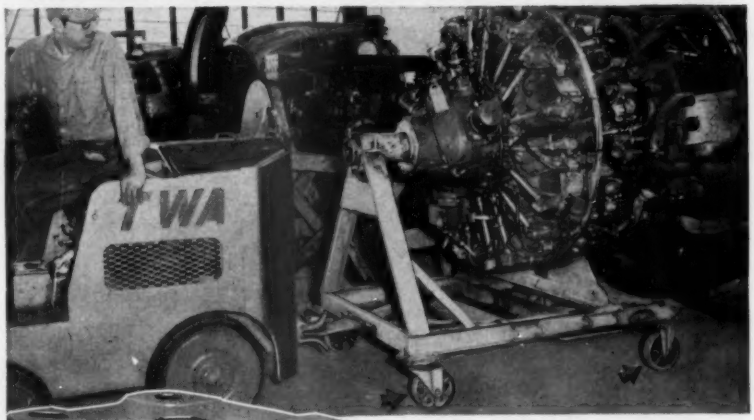
The film features the uses of timber connectors in broadening the applications of engineering principles to wood construction. It presents a view of the use of wood in versatile roof trusses that provide flexibility of interior planning, as well as post-free space, in commercial and industrial buildings and schools.

The movie shows and describes the various types of connectors—wedge-fit split rings, shear plates, spiked grids, framing anchors—and how each functions in achieving more efficient use of wood in light and heavy construction. Sequences include planning, fabrication, assembly, and erection of sawn and laminated wood roof trusses on large and small jobs. Showing time is 14 minutes.

Complete information and reserva-

Faultless CASTER MATERIALS HANDLING FACTS

TRANS WORLD AIRLINES, KANSAS CITY, MO., GETS SAFE, FAST RESULTS WITH FAULTLESS EQUIPPED ENGINE STANDS



Series 600 Faultless Caster cut-away to show two full rows of hardened bearings swiveling around large diameter raceways. Roller bearing, Vulcanized Rubber Tired Wheel. Semi-Steel, Drawn Steel or Plaskite wheels are also available to suit load and floor requirements.

Huge Super Constellation engines are easily moved on Faultless Casters several hundred feet to the TWA overhaul area. There they are transferred to special Faultless Castered stands, allowing engines to be rotated horizontally or vertically for maximum accessibility. The engines and stands move along a production line of several stations where specific work is done on them. As many as 80 engines are on stands at one time. Faultless Casters not only permit fast material handling but the 2½" wheel face protects the plant's floors. The advantages of this type of material handling equipment are numerous, since the conveyance provides a combined work stand and storage dolly. Your local Faultless Industrial Distributor can recommend similar time and money saving methods for you, no obligation. Simply fill in and mail the convenient coupon for FREE Caster data.

MAIL THIS COUPON TODAY

FREE Faultless Industrial Caster Data now ready for you, no obligation. PL-3

☐ File Folder of Caster Specifications

☐ Wall Chart of Caster applications

Name_____

Firm_____

Title_____

City_____ State_____

TWA Martin being re-assembled, with Faultless Castered transport and overhaul stands in foreground.

FAULTLESS CASTER CORPORATION

EVANSVILLE 7, IND.

Offices in Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Dallas, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New Orleans, New York, Philadelphia, Portland, Seattle, St. Louis, Canada: Stratford, Ontario.

FAULTLESS SOLVES THE TOUGH JOBS

For more facts circle 633 on Reply Card

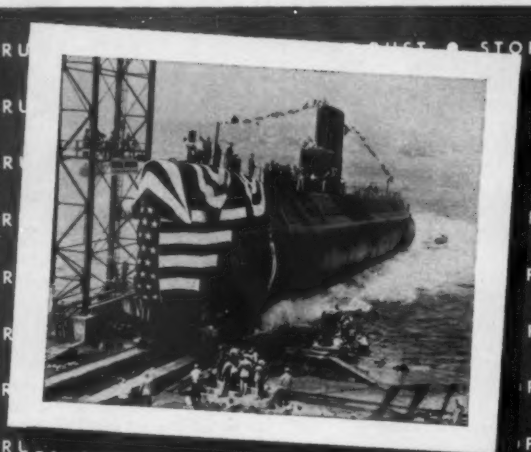
tion forms for booking "Engineered Timber Construction" are available from Timber Engineering Company, 1319 18th Street, N.W., Washington 6, D. C.

Pump Case Histories

"The Choice is Yours" is the title of a recently produced sound slidefilm, which uses case histories to discuss applications and construction features of vertical wet pit pumps. The 15-min film pictures and discusses features of Yeomans Brothers Co. vertical wet pit pumps. These features include "diving bell" construction which protects motors, controls and thrust bearings from flooding; "Lubri-Vac" system which increases pump life; jacketed stuffing boxes for cooling, heating, or pressurizing on special applications and "stay primed" design.

The film is well suited for showings before engineers, company training groups, professional associations, schools and colleges.

A four-page, pocket size folder, describing the film is available on request, either singly or in quantities for distribution before or at the time of the film's showing.



* It's Hot·Dip Galvanized

Naturally, the new nuclear-powered submarine "Seawolf," pictured above, is not completely galvanized. However, a good many essential parts are protected by Hot-Dip Galvanizing. Here are a few: Torpedo Skids, Loading Gear, Deck Beams, Deck Plates, Ladders, Stanchions, Pipe Hangers, Shelves, Guards, Hanger Bolts and Cleats.

The "Seawolf" will operate under the most severe corrosion conditions day after day, and therefore requires the best rust protection available. Hot-Dip Galvanizing was chosen to do the job.

Whatever the product may be, if it's iron or steel, have it protected with Hot-Dip Galvanizing. For the best in galvanizing, send your products to a member of the American Hot Dip Galvanizers Association . . . he has the know-how to give you a top quality job.

Send today for our new booklet "Stop Rust." It gives you the full story on the process, plus a comprehensive coating comparison chart. "Must It Rust" 16 mm film available for showing.

AMERICAN HOT-DIP GALVANIZERS ASSOCIATION

1806 FIRST NATIONAL BANK BLDG., PITTSBURGH 22, PA.

For more facts circle 634 on Reply Card

The film may be booked by contacting the company's local representatives. or arrangements may be made direct with the company at N. Ruby Street, Melrose Park, Illinois.

Circuit Breaker Actuation

A color sound film strip describing the development and operation of the "Pneu-Draulic" operator for circuit breakers has been released by Allis-Chalmers Manufacturing Company.

Three major problems and how they were solved in designing the system for circuit breaker operation are portrayed, accounting for the film strip's title, "Success Story."

Simplified diagrams of the hydraulic circuit show the nine essential elements in the "Pneu-Draulic" operator's system and valve positions during closing stroke and as the ram is returning from the closing stroke. Running time is about 15 minutes.

Requests for prints of the 35mm film for showing before engineering societies and utility groups should be made to the nearest Allis-Chalmers Industries Group sales office.

Ductile Cast Iron

First motion picture film on the properties and applications of ductile cast iron has been released by The International Nickel Company, Inc., 67 Wall St., New York, N.Y., and is now available for use by industry, technical societies, and educational institutions.

The 15-minute sound, color film, "Ductile Cast Iron," illustrates the fact that the new engineering material which can be cast like grey iron has properties similar to steel. The ductility of the iron is illustrated by bending, twisting, impact and tensile tests.

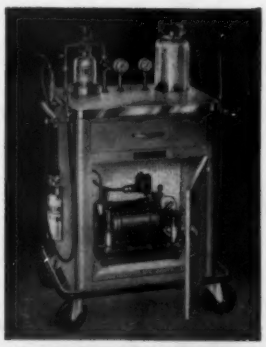
Five years of production experience and use of this material are incorporated in the film. Among the illustrated applications are gears, pinions, plow shares, pistons, and pneumatic couplings. Uses of ductile cast iron are also shown for a variety of industries.

Leland motors here can't fail

The explosion-proof, motor-driven suction and ether unit in a modern operating room *can't fail.* It must pump highly volatile ether to maintain anesthesia, and drain excess body fluids literally to prevent drowning!

Leland engineers—working closely with the J. Sklar Manufacturing Company ...helped obtain the *first and only U.L. Approval ever given an electrically driven apparatus of this type!*

Electric motors? *Leland* knows how to make them. And to tailor them to your specific needs. For the answer to an unusual problem, or information on the complete line of quality motors from ⅙ to 5 hp—soon to 20 hp—in all standard types and enclosures, contact us today.



Class I, Group C Underwriters' Approved explosion-proof Leland Motor dependably powers this dual-purpose Sklar hospital unit.

Another AMF Product

LELAND MOTORS

THE LELAND ELECTRIC COMPANY

Dayton 1, Ohio

Division of AMERICAN MACHINE & FOUNDRY COMPANY

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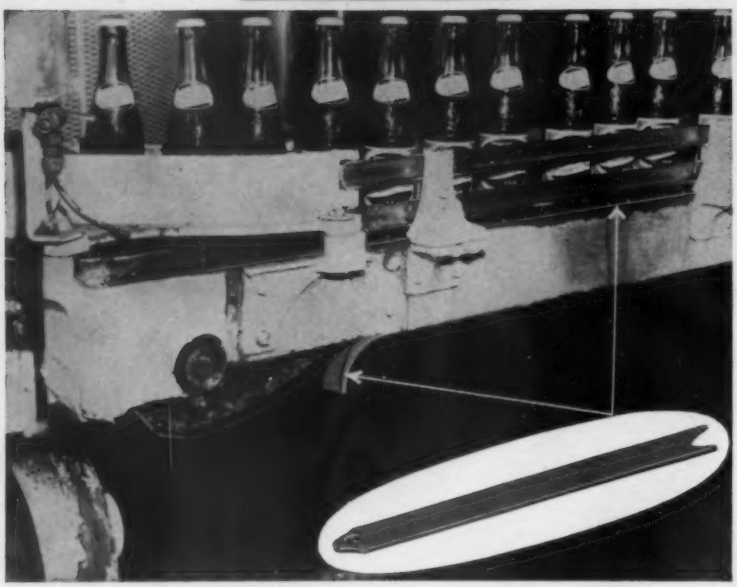
POLYPENCO® NYLON SHAPES



Noisy, Costly Maintenance Problems . . . Solved by POLYPENCO Nylon

A bottling company, forced to shut down twice a year to repair and rebuild the channel in their conveyor stand, turned to POLYPENCO Nylon. Nylatron® GS wear strips made from specially compounded nylon were installed between the frame and the chain to eliminate metal-to-metal contact. After nearly a year, there is no noticeable wear on either nylon or metal surfaces, operation is smoother and quieter.

POLYPENCO Nylon is an established general purpose maintenance material . . . Here's why:

POLYPENCO Nylon's wear resistance, low surface friction and other properties provide longer wear, less downtime, fewer repairs.

POLYPENCO Nylon is available in strip, rod, tubular bar, slab, flexible tubing and hexagonal bar for rapid, low cost machining on standard metalworking tools.

Available For Fast Schedules—High Quality POLYPENCO Nylon shapes are stocked for immediate delivery from warehouses in principal cities.

To solve your maintenance material problem, send for latest descriptive folder on POLYPENCO Nylon shapes.

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In Canada: Polypenco, Inc., 2052 St. Catherine St. W., Montreal, P.Q.

POLYPENCO® Nylon, Teflon*, Q-200.5 and K-51

*DU PONT TRADEMARK

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NEW BOOKS

for the plant Engineer

Manpower Improvement

IMPROVING THE WORK SKILLS of the Nation. Size 9⅞ by 6¼ in.; 203 pp including index; cloth bound. Published by Columbia University Press, 2960 Broadway, New York 27, N. Y. Price $3.50.

UTILIZATION and training of manpower are of vital interest to industrial people as well as the nation in general. This book bears on these aspects and throws some light on how secondary schools, industry and the community can contribute to the betterment of individual work skills. It covers proceedings at the annual conference of the National Manpower Council held in the spring of 1955.

This meeting extended over five days and was attended by 69 persons, representing the government, education, labor and industry. Among the addresses, that were given and are included in this volume, are the following: vocational guidance and the skills of the work force, automation and the skills of the labor force, industry's training effort in improving the work skills of the nation, the government stake in skilled manpower, and our secondary schools and the national manpower needs.

Waste Treatment

PRINCIPLES OF INDUSTRIAL WASTE Treatment by C. Fred Gurnham. Size 9¼ by 6¼ in.; 1955 edition; 399 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $9.50.

THIS BOOK covers sources, pollutional effects and methods for treatment and disposal of liquid wastes produced by industry. A large portion of the book is devoted to treatment before discharge into natural waters or municipal sewers.

The book section on physical treatment engulfs filtration, sedimentation and heat transfer operations. Under chemical treatment, the author covers oxidation and reduction, coagulation and chemical reaction, and adsorption and ionic exchange. Miscellaneous treatment methods discussed in the book involve the use of: biological filtration, activated sludge and lagoons.

Many facets of an increasingly important subject are presented by the author of this book. His presentation does not become overly involved in chemical equations. However, there are spots where a knowledge of chem-

istry including organic work would be of help for a better appreciation of the contents. At any rate, it should be an informative and useful book to those concerned with the problems of industrial waste treatment.

Guide for Foreman

THE FOREMAN'S HANDBOOK edited by Carl Heyel. Size 8 by 5 in.; 587 pp including index; illustrated; cloth bound. Published by McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. Price $6.50.

UP-TO-THE-MINUTE information on solving general and specific problems in connection with a foreman's daily work is covered in this third edition of the handbook.

Twenty-four experts contributed chapters on their specialties. In this book they discuss everything from a breakdown of the foreman's job, work planning and scheduling, and safety pointers, through merit rating of employees and facts foremen should know about present-day labor legislation.

The new edition covers the latest developments in statistical quality control, predetermined time standards, "Standard Minute System" of incentive wage payments and a practical combination of "point system" and "factor comparison" techniques in job evaluation.

This material is presented in seven sections: (1) The Scope of the Foreman's Job; (2) The Foreman's Know-how; (3) The Foreman's Direct Personnel Responsibilities; (4) The Foreman's Co-operative Personnel Responsibilities; (5) Background Information for the Foreman; (6) Work Simplification and the Foreman; and (7) Self-quiz for Executive Development.

Power Tools

HOW TO USE PORTABLE POWER TOOLS by Maurice H. Reid. Size 8 by 5⅜ in.; 201 pp; illustrated; paper bound. Published by Porter-Cable Company, 55 Exchange St., Syracuse 8, N. Y. Price $1.50.

POPULARITY and the wide use of portable power tools points to the need for information on ways to handle them. This handy manual helps supply this type of information which can be useful to maintenance and production men, people in wood and metal working shops and others. It describes a number of kinds of standard portable electric tools, newly developed machines and numerous attachments.

The book contains instructions on uses and handling of tools that are conducive to turning out more work and in much less time than by old hand methods. Here are some of the topics considered in this book: electric

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The new Hamer Visible Wedge is available in Straightway, Tee, and Ell styles meeting all A.S.A. specifications.

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drills, portable saws, sanding and finishing, safety and tool maintenance, and wood and wood products.

Ferrous Metals Standards

BOOK OF ASTM STANDARDS, 1955. Part 1—Ferrous Metals; size 9 by 6 in. approx.; 1834 pp; illustrated; cloth bound. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $13.50.

THIS BOOK is especially important in the heavy machinery, railroad and construction industries. It is an example of the valuable results which come from the Society's technical committees. Through such groups are brought together the viewpoints of producer, consumer, and the representatives of general interest. These lead to the development of competent, unbiased and widely-applicable standards for the manufacture, purchase, delivery, and acceptance of materials.

This volume contains standard and tentative specifications, and methods of test for such items as steel piping materials, flat products, bars, bolts, rivets, billets, forgings, axles, springs, concrete reinforcement and metal powders.

Part One is 11 per cent larger than the 1952 edition. It contains 125 standards that are new or have been revised since the 1954 supplement was published. Since 1952, 211 standards are new or have been revised.

Metal Casting

FOUNDRY PRACTICES by S. E. Rusinoff. Size 8½ by 5⅝ in.; 261 pp including index; illustrated; cloth bound. Published by American Technical Society, 848 East Fifty-Eighth St., Chicago 37, Illinois. Price $6.50.

EXTENSIVE COVERAGE is given in this book to one of the most basic of manufacturing processes known to man—metal casting. This practical text for men in the industry as well as for students has been prepared by an experienced engineer and educator.

Attention has been given in this volume to such items as: Sand-molding processes and core making; machine molding; sand-handling and conditioning equipment; metal-melting equipment; metal handling and cleaning equipment; typical molding problems; and testing cast metals. Safety in the foundry has also been considered in a separate section.

Useful tables have been included with the text material. At the back of the book there is a bibliography of reference material for those interested in pursuing the subject further.

Journal Bearings

BEARING LUBRICATION Analysis by R. R. Slaymaker. Size 9¼ by 6 in.; 108 pp including index; 1955 edition; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y. Price $5.00.

THE AUTHOR has prepared this book principally for the use of engineering college students, with a slant for the machine designer. A working knowledge of Calculus is considered a prerequisite for students of this work. Though the treatment is short, it has been considered sufficient to be helpful in actual bearing design in simple cases and for handling important preliminary planning for complex applications.

Sleeve bearings are stressed in this book which includes case studies and numerical examples. Throughout the volume, the vital topic of oil viscosity is emphasized. Also, there is presented a practical method of predicting temperature rise and oil viscosity in one operation.

Some of the main sections in the contents are as follows: Examples of sleeve bearing design; bearing materials, construction and life; boundary conditions, the coefficient of friction, and oilless bearings. Basic hydrodynamic theory of journal bearings is treated in two chapters.

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SPECIAL

Industrial and municipal turbine generator specialists give priority service up to 15,000 kw.

Worthington specialists in designing and manufacturing turbine generators up to 15,000 kw. are changing a lot of established buying ideas. Because they're not involved with building the huge central station turbine generators, Worthington engineers can give A-1 priority to every phase of design and manufacture of industrial and municipal units. They deliver a power package that has been completely tested, and adjustments made, to shorten installation time. They incorporate latest design advances in the turbine and generator, and finish the job with a streamlined heavy steel jacket to blend with the most modern power plant design.

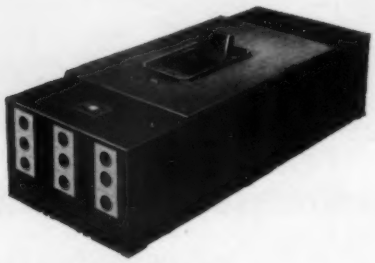
When considering a turbine generator installation up to 15,000 kw., call on specialists in the field. Call your nearest Worthington District Office or write for Bulletin 1960C: Worthington Corporation, A&SP-Turbines, Harrison, N. J.

WORTHINGTON

NEW..."M" Frame Molded Case Circuit Breakers are fully designed for 800 ampere applications

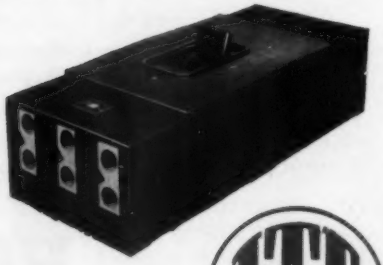
For applications which formerly required larger and more expensive equipment, you can now use the new I-T-E "M" frame molded case circuit breaker without sacrifice of quality. It offers optional pressure connectors for double or triple cable connections per phase contained within the circuit breaker case. Exclusive 3" pole center design dimensions permit easy accessibility for front cable or rear bus and stud connections. And the "M" frame breaker is ideally suited for use in panelboards, power panels, switchboards, motor controls, bus duct plugs, and individual enclosures.

Available with interchangeable trip units providing continuous 600, 700 or 800 amp ratings in 2- or 3-pole construction for 250 volt d-c and 600 volt a-c service. Interrupting ratings (NEMA test procedure): 600 v a-c, 25,000 amp; 480 v a-c, 35,000 amp; 240 v a-c, 50,000 amp; 250 v d-c, 20,000 amp. For more information, write I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa.



Triple cable connectors accommodate three 300-400 mcm cables per phase.

Optional double cable connectors accommodate two 400-500 mcm or 600-700 mcm cables per phase.



I-T-E CIRCUIT BREAKER COMPANY • **Small Air Circuit Breaker Division**

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MARCH, 1956
(This card void after September 30, 1956)

PLANT ENGINEERING

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BULLETINS

(Begins on page 21)

TOOLS, MACHINE SHOP AND METAL WORKING

161 **Machine Tools**—New and improved products are introduced in this company's 80-pp Fiftieth Anniversary Catalog. Covers precision engine lathes, toolroom lathes, turret lathes, shapers, pedestal grinders and drill presses, also attachments, chucks, tools and accessories. Presented for the first time is a vertical spindle milling machine and 13-in. swing turret lathe. Generously illustrated, book provides capacities, floor space requirements and shipping weights. South Bend Lathe Works.

162 **On Joining Steels**—Technical Data Card 155-A summarizes various recommendations for joining, by arc welding procedures, various tubing steels. In addition to indicating proper electrodes to use, it provides information about preheating, postwelding heat treating. The Tubular Products Div., Babcock & Wilcox Co.

163 **Pipe Cutters**—This folder describes application of manually operated cutters to field cutting of asbestos-cement pipe. Contains data and illustrations on a large cutter which cuts all sizes to 20-in. nominal size and a junior model for pressure-pipe and flue-pipe applications. Specifications are included, as well as photos illustrating features. Pilot Mfg. Co.

164 **For Wire Drawing**—Circular 786-W-3, 8-pp, illustrates and describes continuous tandem wire drawing machines, covering drum type, block type and combination type for drawing brass, copper, aluminum, and other nonferrous metals. Contains large illustrations of machines with various types of drive and packaging arrangements. Tables of specifications for die machines and a floor spooler are given. Waterbury Farrel Foundry & Machine Co.

165 **Tap Guide**—Catalog 8, 24-pp, offers data on standard and special taps. Comprehensive tables and information on standard system for tap marking; major and pitch diameter tolerances available in standard machine screw taps; tap recommendations for Classes 2, 3, 2B and 3B Unified and American screw threads; major and pitch diameters for special taps; constants for finding pitch diameter and root diameter of screw threads; and recommended drill sizes included. The Wood & Spencer Co.

Reader Service Cards for ordering bulletins are on the facing page. Be sure to include your name, job title, and company.

166 **Machinery Isolation**—Catalog IS-55 describes machinery isolation for effective vibration isolation, shock protection, and noise reduction. Typical installations, proper methods of installation, types, load ranges, standard sizes and thicknesses are described, and suggested specifications are given. T. R. Finn & Co., Inc.

167 **Hose for Metal Working**—Applications for this company's wire reinforced hose and Portovent duct in the metalworking industries are pictured in Bulletin 50, 6 pp. Lists advantages and includes handy type selector guide. The Flexaust Co.

COST CONTROL

168 **Want to Cut Costs?**—Here's a 12-pp guide to plant engineers considering cost reduction programs. Described in the booklet is a packaged cost-reduction training program which can be styled to needs of individual plant. It includes a continuing better methods program for cutting costs of labor, materials and overhead. Booklet tells how results are achieved through training of supervisors in executive thinking, work simplification, part simplification and burden expense study. S. J. Fecht and Associates.

169 **Waste Reduction**—A service designed to reduce waste and cut costs is described in this brochure. All phases of the service, including "tools" provided for communication, supervision and evaluation of a waste reduction program are detailed. Plan presented is declared effective for both large and small plants. Clarkson Co.

SAFETY, SANITATION

171 **Special Fire Protection**—Bulletin 73, 28-pp, covers fire detection, fire prevention, fire control and fire extinguishment associated with special hazard fire protection. Tells what special hazard fire protection is, describes application, economies, and covers methods of fire detection, such as rate-of-temperature-rise detection, flame or flash, smoke and vapor detection. Methods of fire prevention, control and extinguishment are treated and application photos included. A fire control and extinguishment chart is included. Automatic Sprinkler Corp. of America.

172 **Group Washing Equipment**—Catalog 5601, 28-pp, features company's line of group washing equipment and drinking fountains. Points out advantages of group washing equipment, describes construction and design details, and illustrates typical installations. Bowl compositions of precast marble, stone, stainless steel and vitreous enamel are described, and specifications, photos, drawings and diagrams are included. Bradley Washfountain Co.

173 **Modern Washrooms**—Again made available for distribution to plant engineers is this company's 20-pp Booklet 300 showing the use of clay tile in industrial washrooms, cafeterias, dispensaries, kitchens. Illustrated in full color, shows typical installations and some suggested color combinations of wall and floor tile. American-Olean Tile Co.

METAL FINISHING

175 **On Nickel Plating**—This 20-pp instruction manual on bright nickel plating describes three techniques for electro-depositing—Nickel-Lume Type I, for use in still tanks or with conveyors where work loads are in mild motion; Type II, for use with air agitation; and the barrel process for plating cylinders. Explains bath preparation, converting of existing baths to Nickel-Lume, effect of constituents. Solution maintenance, purification, handling of equipment and materials are discussed, analytical procedures outlined, and plating of special equipment illustrated. Hanson-Van Winkle-Munning Co.

176 **Metal Finishing Systems**—Illustrated with photos, drawings and diagrams, 16-pp Bulletin 51 contains suggestions, tips and ideas on modern ways to achieve better finishes at lower cost, faster production and smoother handling of numerous products such as power tools, automobile frames and refrigerators. Despatch Oven Co.

177 **Plating Waste Treatment**—Technical Report T-143, 6-pp, discusses method used to obtain water re-use and metal recovery and shows savings realized. Details of plant operation, design of recovery system, operational cycle and benefits derived are covered, and a flow diagram is included. Graver Water Conditioning Co.

178 **Selenium Rectifiers** — Bulletin ER-107, 12-pp, describes selenium rectifiers for electroplating, anodizing and related processing. Lists construction, electrical and control features. Also included are specifications of standard bench, self-contained, and remote controlled types of rectifiers, detailing a-c input, d-c output, control, protection and meters available. Photos and electrical circuit diagrams are included. Hanson-Van Winkle-Munning Co.

MAINTENANCE CLEANING

179 **Safety Solvent**—Cleaning of motors and generators, and other equipment, quickly, efficiently and safely, with company's detergent-action safety solvent is detailed in illustrated Bulletin A-28. Describes uses in industry, and includes graphs showing evaporation cycle, optimum evaporation rate. Turco Products Inc.

180 **Heavy-Duty Cleaner**—Eight-pp Catalog 250 describes a high pressure combination unit for continuous heavy duty cleaning. Explains how it offers combined benefits of hydraulic and thermal pressures, and why the cleaning blast produced provides for more efficient cleaning. Design features are described, including control panel which permits five types of cleaning action: high pressure steam; high pressure hot water; dry steam; high pressure cold water; low pressure warm water. Malsbury Mfg. Co.

General Product Catalogs Recently Released

181 **Silicone Products**—Bulletin AD 147, 8-pp, describes company's line of silicone products, including diaphragms, gasketing, packings, tape, oil seals; also extruded, molded die-cut and metal bonded shapes. Discusses resistance to high and low temperatures, and other advantages of silicone rubber. Garlock Packing Co.

182 **Glass Fiber Products**—Form WPD-11, 8-pp, describes and illustrates uses of Microlite and Super-Fine blanket insulations for thermal and acoustical treatments. Also features Microflex compressed board, a resilient cushion material; quartz and glass Micro-Fibers, reinforcements for plastics and yarns for use in textile industries. L. O. F. Glass Fibers Co.

183 **Rubber Products**—Fully illustrated, this 72-pp catalog presents company's line of hose; conveyor, elevator and transmission belting; packing; molded and latne-cut goods; and mats. Provides full information on sizes, weights, applications, construction features, working pressures and other pertinent data. Available to qualified plant engineers; please state your job title when requesting this catalog. Hamilton Rubber Mfg. Co.

184 **Adhesives, Coatings, Sealers**—Properties and applications of a variety of adhesives, coatings and sealers are described in this illustrated 12-pp bulletin. Typical applications in metalworking, transportation, general manufacturing, electrical manufacturing and building products industries are listed in comprehensive tables for easy reference. Adhesives and Coatings Div., Minnesota Mining & Mfg. Co.

185 **Synthetic Fluids, Lubricants**—Form F-6500D, 52-pp, on synthetics, covers properties, applications, and characteristics of these polyalkylene-glycol derivatives. Describes uses as mechanical lubricants, hydraulic fluids, rubber and textile lubricants, heat-transfer fluids, anti-foam agents, solvents, and formulation components. Engineering data is presented in the form of tables and charts, and application photos included. Carbide and Carbon Chemicals Co., Div., Union Carbide and Carbon Corp.

186 **Air Cylinders, Valves**—Consisting of a number of bulletins spiral bound into one master catalog, this booklet features valve-in-head, single and double ended cylinders, solenoid, pilot and hand air valves, spring return clamp and three models of dial feed tables. Products are fully illustrated with photos, sectional views, and diagrams, and tables listing engineering data are included. The A. K. Allen Co.

COATINGS AND LININGS

188 **Protective Coating**—Advantages of a non-flammable protective asphaltic coating compound for weather and corrosion-proofing are pointed out in this informative bulletin. Describes physical characteristics, results of laboratory tests, and application, and includes specification data. Anderson-Prichard Oil Corp.

189 **Improved Coating**—Bulletin 701 introduces an economical, single-package synthetic rubber coating, Neoprene W, for use in corrosive atmospheres in general plant maintenance. Lists basic characteristics of the coating, also stresses ease of application, abrasion resistance, weathering properties. Carboline Co.

190 **Rubber Linings** — Twelve-pp Bulletin 7115, describes acid-proof rubber linings for the chemical, steel and wire, paper, textile, food, plating, water conditioning and phar-

BULLETINS

(Begins on page 21)

maceutical fields. Points out advantages and describes applications. Storage tank design, dimensions and capacities are tabulated, and data on lined pipe, fittings and valves is included, as well as specifications. Raybestos-Manhattan, Inc.

OTHER EQUIPMENT

191 **Leather Packings**—Covering the design and application of hydraulic and pneumatic leather packings, this 58-pp handbook tells what a packing is and how it is used, and discusses advantages of mechanical leather packings. Selection and processing of leather for packings is described, and dimensional and application data for cup, flange, "U," Vee packings, and leather gaskets, washers, and diaphragms provided. Facts on surface finish of cylinders and shafts, hydraulic fluids, are included, along with packing hints, a glossary of terms, and temperature conversion charts, other data. J. E. Rhoads & Sons.

192 **Non-Metallics**—Advantages of fabricating from nylon, Teflon and specialty non-metallics are pointed out in this illustrated bulletin, which describes properties and characteristics. Stock shapes such as rod, strip, tubular bar, slab, flexible tubing, tape and plate, for machining into final form, are described and standard size ranges are given. The Polymer Corp. of Penna.

193 **Clay Conduit Structures**—Bulletin 56, 20-pp, describes clay conduit structures for underground steam, hot water and process piping. Features various types produced by company, and illustrates applications. Engineering and specification data is included, along with photos and drawings. Heat Transmission Conduit Co.

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194 **Packaged Dust Collector**—Bulletin 172-CFF describes a packaged type Aerodyne dust collector, designed for a variety of industrial uses. Large photo illustrates component parts, and design, operation, capacity and dimensional information is briefly summarized. The Green Fuel Economizer Co., Inc.

195 **Data on Panel Material**—This 12-pp booklet is a new edition of a guide to the use of Presdwood. Generously illustrated with drawings and photos, it describes basic and special Presdwood products and their properties, tabulates available sizes, describes working and finishing methods, and illustrates various finishes. Masonite Corp.

196 **Drafting Techniques**—"11 Ways to Save Drafting Time" is the title of this 12-pp pocket-size booklet telling how intermediates can be used to make quick modifications of drawings without changing the original. Covers scissor editing, masking, block-out method, successive additions and pre-printing, other methods. Frederick Post Co.

197 **Brass and Aluminum Nuts**—Catalog 55, 16-pp, covers a line of turned brass and aluminum nuts, including standard hexagon nuts, open- and closed-end cap nuts and knurled thumb nuts, as well as lighting fixture, spark plug and battery nuts. Facilities for production of special and odd size nuts are described. Full specifications are presented in tabular form and photos and diagrams of various types of nuts are included. Fischer Special Mfg. Co.

198 **Evaporators**—Bulletin 10-DE describes company's horizontal shell-type evaporators for boiler make-up water. Features two types—a straight tube type and a U-tube type, and includes cross section drawings of each. Details design and operating features and illustrates typical evaporating system. Schutte and Koerting Co.

199 **Plate Magnets**—Eight-pp Catalog 1205-D describes company's Alnico Perma-Plate magnets for tramp iron removal. Shows four basic types and includes engineering data and specifications for 35 standard sizes. Diagrams show applications for separating tramp iron or iron of abrasion from material carried in chutes, ducts, on belts or slides. Dings Magnetic Separator Co.

200 **Industrial Incinerators**—Illustrated Form 10558M describes, gives specifications, and lists optional equipment for a line of industrial incinerators. Cutaway view shows features. Winnen Incinerator Co.

201 **Glassed Steel Reactors**—Bulletin 927, 8-pp, describes glassed steel reactors for processing a wide variety of products under diverse conditions, stressing their versatility as to corrosion resistance, agitation, and temperature-pressure range. Standard specifications are tabulated and dimensional diagrams are included. The Phaudler Co.

202 **Selector Charts**—Bulletin CE-50, 20-pp, contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps; rubber-lined tanks and equipment. American Hard Rubber Co.

203 **For Ailing Hydraulic Systems**—This trouble-shooting chart for hydraulic systems, designed for display in shops, will help operators and maintenance men spot and cure common troubles. Lists common causes of trouble and tells what to do to correct them. Sun Oil Co.

204 **Corrugated Cans**—Catalog 63, 29-pp, discusses advantages of company's heavy gage steel corrugated ash and garbage cans, oily-waste cans, and roller cans. Describes design and construction details, results of performance tests, and features specification data on various types and styles. The Witt Cornice Co.

205 **On Rock Crushing**—"Measuring the Crushing Resistance of Rocks and Ores" is the title of this 12-pp bulletin. Methods and means for measuring crushing resistance and abrasiveness of rocks, minerals and ores are discussed in detail and illustrated. Pennsylvania Crusher Div., Bath Iron Works Corp.

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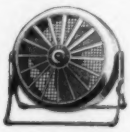

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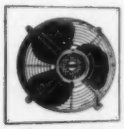

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VALVES, TRAPS, PIPING AND ACCESSORIES

301 Choosing the Right Valve—Presenting valve selection as a matter of matching the valve's service characteristics with the service requirements of the job, this practical 20-pp booklet explains and illustrates basic design features of gate, globe and check valves. It tells in non-technical language, how each of these valve types works, and where it is best suited for use. Disc, stem connection, bonnet and bonnet-joint characteristics are also discussed and stem-operation is treated. Crane Co.

302 Corrosion Resistant Valves—Monel and nickel corrosion-resistant valves are described in Bulletin 9. Discusses corrosion-resistant properties of Monel and nickel, listing specific applications for which each is suited. Gives casting composition of both alloys and describes their mechanical properties. Cross-sectional illustrations of gate, globe and check-type valves are included. Alloy Steel Products Co.

303 Hydraulic Control Valves—Eight new hydraulic control valves with ball detent for position locking are described in 26-pp Section 4 of this company's Catalog 200. Included are six three-position, four-way valves, and two two-position, four- and three-way valves. Dimensional data and typical circuit diagrams are provided. Logansport Machine Co., Inc.

304 Bronze Valves—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions. The Walworth Co.

305 Valve Charts—Now available to plant engineers are three well-organized wall charts on valve types, selection and protection. "How to know valves" covers four main types of valves from the standpoints of their appearance, inside construction, service intended, operation and use. "How to select valves" discusses five major factors involved in the choice of a valve—fluid, temperature, pressure, size, and function. "How to protect valves"—written in "do and don't" syle covers 11 important points on valve installations, operation and maintenance. R-P & C Valve Div., American Chain & Cable Co.

306 Bronze Valves—Bulletin 110 points out the advantages of company's "500 Brinnell" bronze globe and angle valves with stainless steel seat and disc. Design features are illustrated and dimensional data is included. Kennedy Valve Mfg. Co.

307 Butterfly-Valves — Construction details, engineering and application data on butterfly valves are provided in three illustrated bulletins. Eight-pp Bulletin 557 covers those of standard heavy-duty construction; Bulletin 558, 8 pp, those of standard medium-duty construction; and Bulletin 559, rubber-lined butterfly valves. W. S. Rockwell Co.

308 Valve Installation Tips—Comprehensive instructions on proper way to install company's Line Blind valves are given in this pocket-size 24-pp manual. Concisely written, the booklet is illustrated with cartoon-type drawings. A separate section is devoted to trouble shooting for faulty-installation techniques along with recommended corrective procedures. While dealing primarily with Line Blind valves, this information can be applied also to gate, globe and plug valves. Hamer Oil Tool Co.

309 Unions, Check Valves—Illustrated Catalog 55, 24-pp, describes and provides ordering information on a line of forged steel unions and check valves. Socket-weld, high-speed, orifice, O-ring and other unions are included. Catalog provides service recommendations, dimensions and list prices. Also included is table covering discharge of water to atmosphere. Clayton Mark & Co.

310 Steam, Air and Gasoline Traps—Catalog 751, 32 pp, is a trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressure up to 1500 lb. W. H. Nicholson & Co.

311 Steam Trap Selector—Twelve-pp Bulletin T-9 is designed specifically to aid in the selection and application of steam traps on chemical processing equipment. Features a fold-out piping diagram for 22 pieces of typical processing equipment—each showing recommended steam trap and piping arrangements. Also contains steam trap selector tables. Yarnall-Waring Co.

312 Steam Trap Solutions—Bulletin F-151, titled "Solving Steam Trap Problems," is a 36-pp illustrated booklet giving specifications and capacities of steam and float traps, air release valves, pipe line strainers. Tells how to calculate condensation loads and select traps for unit heaters, jacketed kettles, submerged surfaces. Gives pointers on installing and servicing traps. Also included in this edition is information on combination flat and thermostatic traps. The V. D. Anderson Co.

313 Valve Couplings—Bulletin 551 presents engineering data on company's line of valve couplings, hose couplings and hose clamps. Includes dimensions for valve couplings, price list, and a table showing dimensions of standard hose couplings. C. B. Hunt & Son, Inc.

314 Improved Hose Coupling—A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines is described in this 16-pp bulletin. Describes the coupling's construction and explains how it provides a sealing action which makes the coupling tighter as internal pressure increases, and a full swiveling action that prevents hose twisting and kinking. Titeflex, Inc.

315 Expansion Joints — Rubber expansion joints for relieving strains and stresses in piping, absorbing vibration, eliminating noise are the subject of 8-pp Form AD-137. General advantages of rubber expansion joints are presented, and spool-type, U-type and rectangular-type joints are described as to construction and intended services. Also provided is catalog sheet on all-Teflon joints and Teflon-lined rubber joints. The Garlock Packing Co.

316 Wrought Iron Pipe—Technical information required in specifying pipe and tubing is graphically presented in this 52-pp catalog. Tables list size and dimensional data of wrought iron pipe and tubular products, and show dimensions. Data is also provided on wire and sheet metal gages, flow of water in gpm and conversion factors. Tables include size and dimensional data for various types of pipe. Supplementary tables give information on wrought iron physical characteristics and special properties. A. M. Byers Co.

317 Welded Fittings—Catalog 3 is a 36-pp ordering and engineering reference book on company's Weldolets for piping services. Gives data on butt-welding and socket welding Weldolets as well as on Thredolets for making threaded outlets. Typical installations are pictured; sizes, weights and prices provided. Also included are installation instructions and a technical section. Bonney Forge & Tool Works.

318 Pipe Insulation—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between —300 and 800 F. Complete listing of physical properties, condensed specifications are given. Pittsburgh Corning Corp.

319 Jacketed Piping, Cocks—Twelve-pp Bulletin 152 discusses the special advantages, problems and requirements of jacketed piping installations and shows how manufacturer's jacketed piping, cocks, fittings and relief valves are designed to fulfill requirements. Illustrated with photos and drawings, includes specifications. Parks-Cramer Co.

320 Vibration Hangers—High-deflection, heavy-duty vibration hangers for suspended equipment and piping systems are described in Catalog VH-55. Two types are presented: rubber-in-shear type, and steel spring type. Dimensions and specifications, installation instructions are given and company's engineering services described. T. R. Finn & Co., Inc.

321 Piping Insulation — Seven-pp Bulletin SO 1054 features a snap on, one-piece molded pipe insulation of fine glass fibers for hot or cold piping. Specifications are given for industrial, commercial, and institutional piping where maximum efficiency is of primary importance and for hot water and low pressure steam. Gustin-Bacon Mfg. Co.

PUMPS, COMPRESSORS

322 Compressor Data — Feather valve compressors from 75 to 350 hp are described in 32-pp Bulletin L-676-B1A. Advantages on installation, operation and maintenance costs are outlined for types YC and DYC compressors. Information and illustrations are offered on component parts including frame, running gear parts, intercooler, crosshead, motor and main bearings and various cut-away views are included. Variable capacity control information is listed along with data on governors. Diagram illustrates correct selection and coordination of auxiliary equipment. Worthington Corp.

323 For Hazardous Liquids—Catalog Section D, 12 pp, presents company's line of Underwriter rotary pumps for hazardous liquids. Both mechanical seal and deep stuffing box models are shown and dimensions and specifications provided. Various mounting arrangements and drives available for these UL approved pumps are also cataloged, and application suggestions are given. Also in this booklet are performance graphs. Viking Pump Co.

324 Condensation Pumps—Eight-pp Bulletin 1403 describes company's line of condensation pumps for use in low and medium pressure-heating systems and steam-process equipment. Photos, drawings and other technical data on capacities and dimensions pertaining to construction, application and installation are included. C. A. Dunham Co.

325 Continuous Flow Pump—Bulletin 30-C, 8-pp, outlines advantages of company's Moyno pumps which handle a variety of materials—from free-flowing liquids to non-pourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities, and includes photos, diagrams and specifications. Robbins & Myers, Inc.

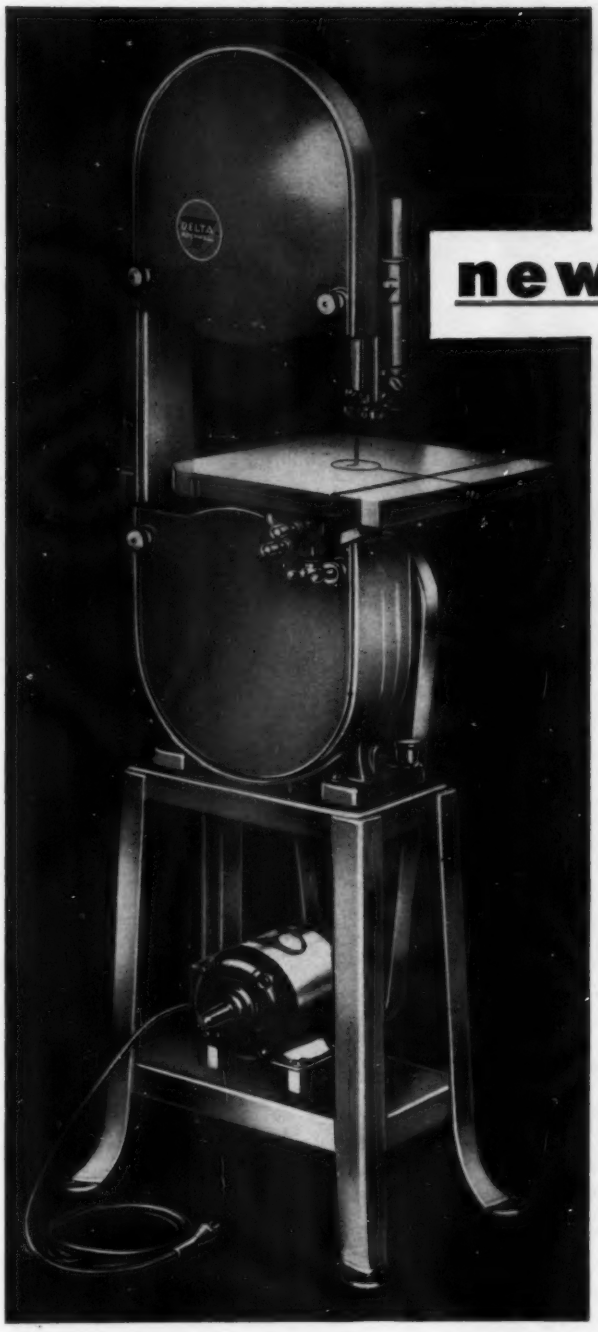
326 Steam Pump—Bulletin 230 describes a horizontal duplex steam pump with piston valve steam chest. Explains advantages of this construction, including high recovery of fuel cost when exhaust steam is utilized. Provides sectional and exterior views of the pump, also specifications, capacities and dimensions. Warren Steam Pump Co., Inc.

327 For On-the-Spot Air—Eight-pp Form 2302 features company's self-contained Spot-Air portable compressor. Deals with the many tools it will operate, with actual on-the-job illustrations pointing out added advantages of this light-weight compressor on jobs where bigger compressors are not needed. Ingersoll-Rand Co.

328 Compressors — Bulletin A72, 36 pp, gives construction, operation information on company's Class WN-114 heavy-duty air compressors. Illustrates seven models of compressor as a single unit for displacement capacities from 1186 to 1948 cfm, twin units furnishing up to 3896 cfm. Joy Mfg. Co.

FANS, BLOWERS

329 Induced Draft Fans—Eight-pp Bulletin DB-32-53 provides engineering information on manufacturer's Bifurcator fans for providing controlled draft for boilers and furnaces. Gives construction details, sizes. Illustrated with photos, diagrams of suggested methods for installation. DeBothezat Fans Div., American Machine and Metals, Inc.



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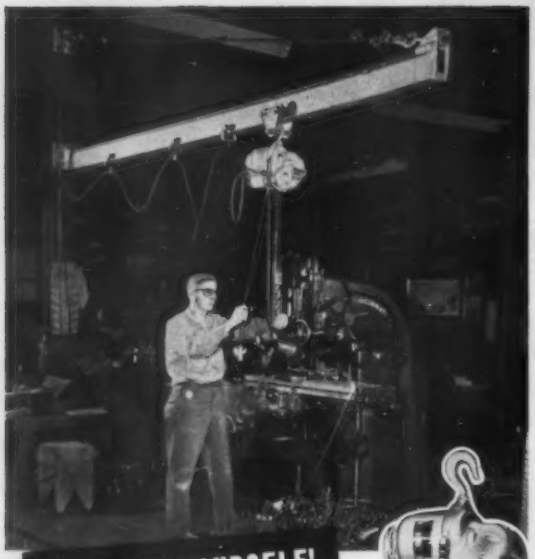

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DATA FILE

(Begins on page 206)

330 **Standard Duty Fans**—Design and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 543. Points out advantages, shows arrangement and application, describes accessories. Tables list material specifications. The New York Blower Co.

331 **Vaneaxial Blowers**—Direct-drive, vaneaxial blowers, three types of belt-drive blowers and a portable blower for exhausting fumes from tanks are described in 16-pp Bulletin A-110. Includes dimension drawings, also air delivery tables. Hartzell Propeller Fan Co.

MAINTENANCE

332 **Light Scaffolds** — This series of illustrated bulletins describes company's line of aluminum alloy Up-right scaffolds and accessories. Pictures one-piece sections and multi-section models with various ranges of adjustability. Points out such features as locking hooks which provide automatic security and locking casters for safety on stairways and inclines. Up-Right Scaffolds Div., Up-Right, Inc.

333 **Building Maintenance** — Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, roadpatching, roofing materials. Includes instruction for applying them. Flexrock Co.

334 **Better Floor Care** — This illustrated folder describes products designed to aid efficient floor care. Lists combination scrubber-vac machines, conventional scrubbing-polishing machines, steel-wool pads, applicators, vacuum cleaners, mop trucks and other mopping equipment. Included are waxes, sealers and cleaners. Finnell Systems, Inc.

335 **Repairing Concrete Floors** — A seven-step procedure for repairing concrete floors with non-shrink mortar is described in this folder, EPMM-4. Each step is illustrated with an actual photo and description of step involved. Strength comparisons between plain mortar and non-shrink pre-mixed mortar are given. The Master Builders Co.

336 **Basic-Roofing Information**—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also special features of company's roofing materials. Johns-Manville.

337 **Insulation Coating**—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's NoDrip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster or composition surfaces. Lists applications and describes methods of applying. Contains tabulated data on quantity required to cover various size tanks and pipe. J. W. Mortell Co.

338 **Guide to Rust Prevention**—The 24-pp general catalog provides a treatise on rust prevention. Features 94 color chips of manufacturer's products and includes instructions for surface preparation and application of primers, short- and long-oil types, machinery and implement finishes, chemical and heat resistant types, sealers, oil field finishes, thinning oils and floor and masonry coatings. Rust-Oleum Corp.

WIRE ROPE, SLINGS

339 **Sling Chain Handbook**—Illustrated Data Book 100, 32-pp presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of sling chains and attachments, and their sizes, weights, and working load limits under many conditions. Columbus McKinnon Chain Corp.

340 **Sling Handbook**—The 64-pp Tuffy Sling Handbook is replete with illustrations, charts and diagrams describing 16 factory fitted slings and nearly two dozen standard fittings available for slings, including several which are recent

DATA FILE

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additions to the line. Book contains a complete rigger's manual, shop chart of ratings, an engineer's notebook and standard signals for directing operations of overhead traveling cranes and derricks and locomotives. A new development featured is the steel ferrule splice now on all Tuffy slings, which affords safety and other advantages. Union Wire Rope Corp.

342 **Wire Rope Assemblies** — Catalog 5201, 22-pp, describes company's wire rope assemblies, used for operating controls, as a part of machinery and equipment, or for slings and hoists. Gives general applications for various types of wire rope assemblies, and includes specifications, ordering details. Macwhyte Co.

CONSTRUCTION

343 **Aluminum in Architecture**—This 32-pp booklet provides information on use of aluminum, and of special interest is a discussion on architectural colors for aluminum exterior surfaces. Also describes basic types of aluminum finishes—satin, sandblast, bright, and "as fabricated." There are drawings and details of copings and gravel stops; curtain wall products, including facings, panel assemblies and wall units; industrial roofing and siding, weatherside and underside fasteners; trim and molding; sheet, plate, foil, pipe, rod and bar stocks; and structural shapes. An alloy section lists mechanical properties of applicable alloys. Aluminum Co. of America.

344 **Panel Wall Construction**—The advantages of company's M-Type Q-Panel walls are outlined in 12-pp Bulletin Q-35-55. Includes installation photos, diagrams, specifications, as well as drawings pointing out structural details. H. H. Robertson Co.

345 **Glass Block Fenestration**—The natural ventilation characteristics of glass block fenestration are presented in this illustrated report of a test project. In some 88 pages, report covers sun hoods, window types, dual outlets, air speeds, double loaded variations, reverse draft, and ventilation below the window sill. Test data is summarized and recommendations included. Kimble Glass Co.

346 **How to Glaze with Plexiglas**—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this sheet. Plastic Dept., Rohm & Haas Co.

347 **Fiberglass Reinforced Panels**—This file of bulletins covers fiberglass-reinforced panels for a wider range of industrial glazing jobs. Data is provided on shatterproof panes, Fire-Snuf panels, and metal-reinforced security panels. Strength test reports and physical data as well as information on light transmission qualities are included. Resolite Corp.

348 **Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features; gives fabricating data. Alan Wood Steel Co.

349 **Steel Grating and Treads**—Bulletin 2486, 16-pp, describes types, sizes and load characteristics of company's line of electroforged steel and interlocked aluminum grating and treads. Points out advantages in design and construction resulting in greater safety, pictures applications, and includes specifications, photos and diagrams. Blaw-Knox Co.

350 **Metal Grating Handbook**—Sixteen-pp Form 500 is data and specification manual covering all types of grating, open steel floor armor, stair treads, vessel liners, decking and drain grates. Contains safe load tables for basic types of gratings, panel width constant charts, tables on standard widths and types of steel treads, types of anchors used for grating. Klemp Metal Grating Corp.

351 **For Stairway Construction**—This 12-pp illustrated booklet describes the use of this company's Junior channels in stairway construction. Provides specifications and shows some of the buildings in which the channels have been used as stair stringers. Tables give size and weights, and show allowable loads. Jones & Laughlin Steel Corp.

352 **Brick Floors**—Advantages of brick as a floor material are pointed out in this illustrated bulletin, 3h/Dr. Stresses such qualities as handsome appearance, excellent sanitary properties, resistance to acids and alkalies, durability, easy cleaning. Application photos included. Drehmann Paving and Flooring Co.

353 **Air Tools, Paving Breakers**—These two bulletins describe company's latest models of paving breakers and air tools for plant construction and maintenance work. Bulletin PB1 gives features and specifications on heavy-duty, medium-weight and lightweight paving breakers, as well as tools for use with them. Bulletin ST-100 describes and gives specifications for clay spaders, trench diggers and backfill tampers. Gardner-Denver Co.

STORAGE EQUIPMENT

354 **Storage Shelving** — Rapid erection, strength and other advantages of manufacturer's storage shelving are stressed in this illustrated bulletin. Shows component parts, open types, closed types and some of the many combinations of dividers, bins, doors available. Also presents tool inserts, other shop equipment. DeLuxe Metal Furniture Co.

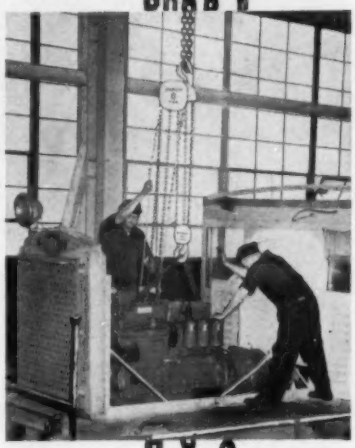
355 **Storage Equipment**—Catalog 100-E, 72-pp, illustrates and describes company's complete line of steel cabinets, folding chairs, chests and safes, stools, tool boxes, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and other specifications. Photos illustrate some typical equipment installations. Lyon Metal Products, Inc.

LUBRICANTS, LUBRICATION

356 **Colloidal Dispersions** — Forty-four colloidal and semi-colloidal dispersions for operational functions, maintenance, lubrication, and other industrial applications are listed in this revised booklet. Includes dispersions of graphite, molybdenum disulfide, mica, vermiculite, zinc oxide, and acetylene black. Carriers and diluents are given. Acheson Colloids Co.

357 **Automatic Lubrication**—Sixteen-pp Catalog L-52 describes force feed lubricators of all types of machinery. Illustrated, gives full design and construction details on company's open and enclosed type lubricators, available in capacities from 2 to 32 units, 1 to 24 feeds per minute. Hills-McCanna Co.

358 **Proper Lubrication**—Presenting proper lubrication as the life blood of all machinery, 36-pp Lubriplate Data Book 54-1 is a helpful treatise on modern lubrication practice. Gives product data on both oil type lubricants and greases and discusses choice of lubricants for use in applications involving heavy loads, high speeds, extreme temperatures, water conditions and other conditions. Provides tables of specific recommendations for various classes of equipment used in chemical processing, metal-working, other industries. Lubriplate Div., Fiske Brothers Refining Co.



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(Begins on page 206)

359 **Centralized Lubrication** — Pocket-sized 24-pp, Form 34-22, called "Ask Anyone in Industry" describes in comic-book form the hazards and inefficiency inherent in conventional lubrication practice and promotes use of centralized lubrication—in the form of Alemite Accumeter measuring fittings. Shows how these are connected by tubing to a lubrication pump controlled by a timer. Alemite Div., Stewart-Warner Corp.

360 **For Better Lubrication**—Advantages of company's lubricants which are specially compounded for lubrication of reduction gear drives are outlined in this pocket-size folder. Features which assure smooth, trouble-free gear drive performance and lower maintenance costs are listed. Gulf Oil Corp.

361 **Selection of Lubricants**—Progress in the application of industrial lubricants is discussed in this 16-pp bulletin, No. 5 V.41 of company's lubrication magazine. Describes various kinds of oilers, centralized lubrication systems, atomized lubrication, and includes photos illustrating text. The Texas Co.

VIBRATION CONTROL

362 **Improved Machine Mounts**—This brochure describes advantages of company's leveling machine mounts. Tells how they enable installation and leveling of heavy machines without bolting or shims, afford increased machine mobility, reduce maintenance costs, and lessen noise. Barry Controls, Inc.

363 **How to Cut Vibration**—The use of Vibra-Mount felt in reducing machine vibration and accompanying noise is covered in this 20-pp illustrated booklet. Tells where this shock-absorbing felt is used effectively, how to select the proper mount, and how to install it. Cost information is provided, other felt products are listed. American Felt Co.

364 **Vibro-Isolators** — Bulletin K3A gives latest data on stopping vibration, shock and noise transmission by using company's steel spring machinery mountings. Typical case-histories, complete with installation photos, tell how vibro-isolators solved a variety of vibration problems. Tables giving capacities and characteristics are furnished, including isolator sizes, load capacities, dimensions, and shipping weights. Drawings illustrate typical installation arrangements. The Korfund Co., Inc.

BOILERS, GENERATORS

365 **Packaged Boilers** — This 16-pp illustrated catalog describes manufacturer's new Type VP Package boiler. Following a section of background information is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 40,000 lb per hour. Space requirements are shown in a table along with specifications. Combustion Engineering, Inc.

366 **Steel Boilers**—Revised General Catalog 80, 32-pp, is a condensed but complete product guide on company's high and low pressure steel boilers. Also included are full descriptions and illustrations of water heating products, both direct fired and storage types as well as indirect water heating coils. Pages on boiler support brackets, structural steel suspension and induced draft fans, as well as pictures of installations are included. Kewanee-Ross Corp.

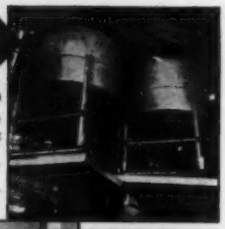
367 **Package Boilers**—This 12-pp booklet on package steam generators, describes the formulas behind all package steam generators, and illustrates how installation of a package steam generator can raise steam capacity in an existing boiler room without extensive structural changes. Shows plant operators how to make survey of their own steam requirements. Cyclotherm Div., National-U. S. Radiator Corp.

368 **Standard Generators** — Bulletin B-55-4 describes company's SC economy series of standard steam generators designed to reduce steam costs for industrial plants. Pre-engineered, standardized steam generators offered in nine sizes, with capacities of from 50,000 to 150,000 lb per hour are described, and schematic and

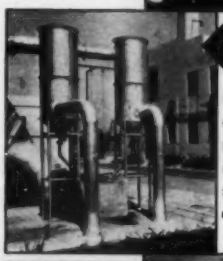
Inside—Outside Topside!

MULTI-WASH DUST COLLECTORS need no productive floor space

Inside



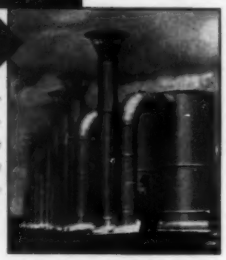
How Multi-Wash collectors can be installed, up off the floor, inside the building.



Outside

Installation of collectors outside the plant, conserving floor space for productive work.

Topside



Battery of Multi-Wash units installed on the roof of a large production factory.

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(Begins on page 206)

cutaway drawings of the units and design features are included. Foster Wheeler Corp.

369 **Water Tube Boilers**—This 12-pp bulletin describes and illustrates various types of water tube boilers and auxiliaries, including water cooled furnaces, superheaters, economizers, air preheaters, and steam washers. Also contains diagrams, tables, and boiler data. Edge Moor Iron Works, Inc. Div. of Condenser Service & Engineering Co., Inc.

INSTRUMENTS, CONTROLS

370 **Versatile Electronics**—How flexibility of electronic temperature controls makes them useful in a wide range of heating and air conditioning installations is explained in this 16-pp booklet, Bulletin SA-2681. Purpose of publication is to fill the gap between the theory of electronic bridge circuits and specific control layouts and circuit diagrams. Four basic features that give electronic control its flexibility and application to a wide variety of installations are described. Minneapolis-Honeywell Regulator Co.

371 **Thermal Controls** — Descriptive and basic technical data on company's Thermoswitch controls are presented in 16-pp condensed Catalog 500. Products listed include the following types of controls: standard line, differential expansion; liquid filled snap-action, midget and miniature differential expansion; indicating controllers, bulb and capillary, and electronic. Fenwal, Inc.

372 **Tank Contents Gages**—Bulletin 463 describes remote and direct reading tank contents gaging systems and also dial type hydrostatic type gages. Included are illustrations of indicators available. The Liquidometer Corp.

373 **Thermostatic Shower Control** — Safety advantages of the Hydroguard thermostatic controls for showers are outlined in illustrated Bulletin 366. Design and construction details are shown, capacity, and applications in industrial plants and institutions cited. The Powers Regulator Co.

374 **Orifice Meters**—Bulletin 1050 Rev. I, 28 pp, shows how manufacturer's orifice meters are made, how they operate. Tables give capacity data, and there are descriptions of manifold arrangements and differential ranges, along with illustration of various parts. Sketches show how meters are used. Rockwell Mfg. Co.

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375 **For Industrial Metering**—Practical selection and application data on meters for industrial liquids are provided in 20-pp Form 566. Explains value of metering in batch mixing, process and cost control. Illustrated charts show how to select proper meter according to type, temperature and flow rate of liquid to be metered, and include specifications for models shown. Strainers, valves and other accessories are described. Neptune Meter Co.

376 **Temperature Controls**—Eight-pp Catalog CC, on temperature controls and allied equipment for heating and refrigeration, provides information on recording, indicating, non-indicating controls; thermometers; bulb installation accessories; process timers, and gas pilots. Includes prices and references to detailed literature. The Partlow Corp.

377 **Contour Projectors**—The use of projection or optical gaging with company's contour projectors is discussed in this illustrated bulletin. Points out chief advantages and describes typical applications. Specifications and dimensional diagrams for a number of models are included. Eastman Kodak Co.

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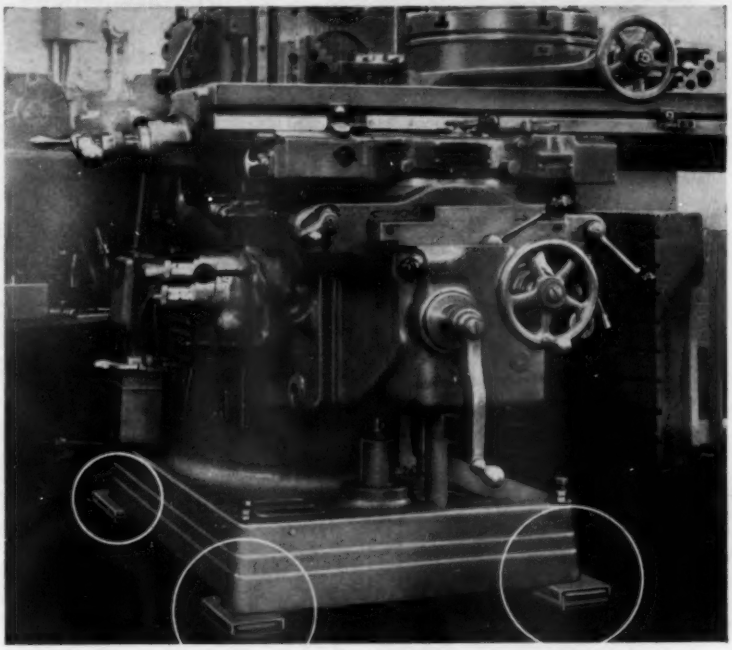

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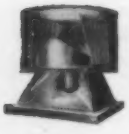

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DATA FILE

(Begins on page 206)

MECHANICAL POWER TRANSMISSION

378 Sprockets and Chain — Bulletin A-624 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. Devotes a page to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Corp.

379 Roller Chains, Sprockets—Catalog 754, 64 pp, describes, illustrates a line of roller chain stock sprockets, including minimum bore sprockets for reboring, also finished bore and Taper-lock bushed sprockets which are ready to use. Tables show speed ratios for sprocket combinations, standard keyways and setscrews. Includes chain selection and application data, installation and lubrication recommendations, chain length calculations, dimensions and price lists for single and multiple strand roller chains. Diamond Chain Co.

380 Power Transmission Equipment—Form 118, 24 pp, gives descriptive and technical information on variable speed pulleys, wide V-belts, sheaves, motor bases, countershafts, and Select-O-Speed transmissions. Illustrated with photos and dimensional drawings, booklet provides ratings, sizes, application and installation tips. Lovejoy Flexible Coupling Co.

381 Improved V-Belts—This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

382 Flexible Couplings — Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail. Thomas Flexible Coupling Co.

383 Fluid Couplings—Bulletin 144-D, 14-pp, presents complete installation and performance data on fluid couplings. Illustrated with diagrams and drawings, bulletin shows ease of applying company's fluid couplings on any type industrial equipment, powered by any type electric motor or internal combustion engine from ¾ to 850 hp. Describes standard models providing standard input, output combinations, and standard models in packaged units. Installation hook-ups are given, along with typical applications. Twin Disc Clutch Co.

384 Coupling Data — Bulletin 240 describes a quick-connect, quick-disconnect H coupling, its uses and construction, with particular reference to U-packer which gives positive seal without compression set because of rubber distortion. A fully detailed cutaway of coupling is included and dimensions and ordering information given. Snap-Tite, Inc.

SPACE, PROCESS HEATING

385 Unit Heaters—Bulletin 7517, 48 pp, presents full information on latest design of this company's Venturafin unit heaters for steam or hot water applications. Gives features of construction, general engineering data, capacity tables. Fully illustrated with photos of horizontal and vertical models, dimensional drawings and piping diagrams, booklet includes tips on the use and selection of unit heaters. American Blower Corp.

386 Plumbing, Heating Supplies—Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated; gives sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

387 Engineering Data for Heating Systems —A great deal of helpful information on heat-

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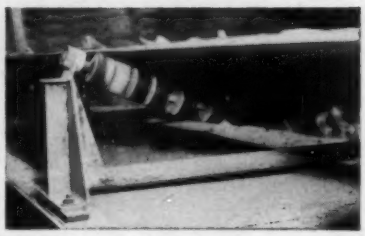

Still on the go after 2½ "no-downtime" years handling abrasive foundry sand, with a 90% reduction in idler maintenance—that is the record of a unique belt conveyor idler, the Joy *Limberoller.*

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Because of these unique features, many companies have adopted *Limberollers* as standard for all belt conveyor operations. *Limberollers* are available for belt widths of 18" —42". Details from ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ont.* Bulletin 61-15.

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DATA FILE

(Begins on page 206)

ing systems is presented in Engineering Data Manual 2695, 28 pp. Detailed illustrated information pertaining to heating problems is given. Besides covering heating terminology, there are sections on steam data, water properties, piping data, weights and measures and pipe dimensions. C. A. Dunham Co.

388 Unit Heaters—Catalog 155, 32 pp, presents unit heaters for steam and hot water in vertical and horizontal delivery and power-throw types. Covers design features and provides performance and capacity data. Also provides information on unit heater selection, sound ratings, locating unit heaters, motor wiring and control. Piping and installation suggestions are included as well as typical unit heater specifications. Modine Mfg. Co.

389 Revolving Unit Heaters—Bulletin HR-64, 16-pp, features revolving unit heaters for industrial plant heating, presenting design and construction details and showing typical installations. Engineering data, mounting heights and coverage, and dimensions are tabulated, and dimension drawings are included, along with installation planning tips and specifications. L. J. Wing Mfg. Co.

390 Electric Heat, 101 Ways—Principal industrial heating applications and methods are described in "101 Ways to Apply Electric Heat," a 32-pp booklet. Illustrated case histories show how metal-sheathed electric heating units are being used. Physical aspects of installation are detailed along with a discussion of the problem, solution and advantages obtained. To illustrate liquid heating, diagrams and photos show best applications for the elements and heaters. Similar treatment is accorded problems of heating air and gases; melting soft metals and viscous materials; and heating machinery and equipment parts. A section is devoted to far-infrared heating. Edwin L. Wiegand Co.

391 Hot Water Heating Systems—Catalog GK-954, 24 pp, features a complete line of equipment for forced hot water heating systems and chilled water cooling systems. Nine pages are devoted to information on a complete line of circulating pumps for dozens of applications. All-bronze pumps for circulating service water and silent operating centrifugal pumps for boosting water pressure are a few of the new applications. Valves, fittings, air vents, air tanks and water heaters are also described in detail. Bell & Gossett Co.

392 Hot Water for Industry—An excellent engineering data booklet, "Hot Water for Industrial Plants," is a compilation of literature covering use of water heaters for process needs, cafeterias, lavatories, wash fountains, laboratories. Discusses hot water requirements for these applications; describes and illustrates heaters, recovery systems, booster units applicable; provides installation suggestions and operating instructions. Available to qualified plant engineers, please state your title. A. O. Smith Corp.

393 Industrial Ovens—Engineering, manufacturing and installation of processing ovens are described in Bulletin D-53-20, 16 pp. Covers oven types, application to industry source of heat, selection of heater, control of heat, distribution of heat. Photos show typical oven installations, and a complete modern finishing process is presented. Newcomb-Detroit Co.

394 Industrial Ovens—Thirteen types of company's Conventioneered ovens, which apply principles of forced convection heating to various industrial processes, are illustrated and described in 12-pp Bulletin 200. These ovens serve foundries, metal finishers, plastics producers. The W. W. Sly Mfg. Co.

MATERIALS HANDLING

395 Cranes for Big Jobs—A new 1½-yard shovel, 35-ton crane is described in this 6-pp catalog. Action pictures of the machine in quarries and gravel plants are included, also specifications. American Hoist & Derrick Co.

396 Electric Hoists—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb. capacities. Fully illustrates and

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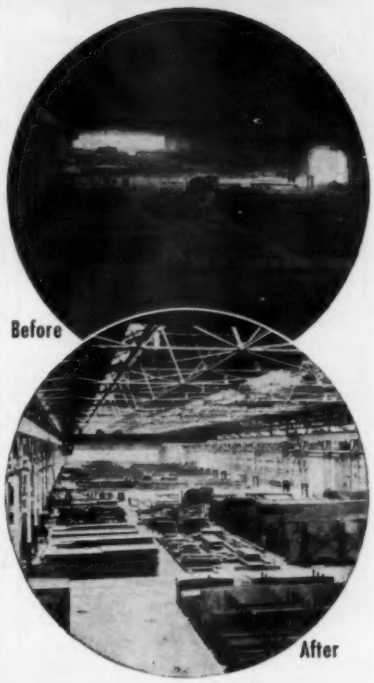

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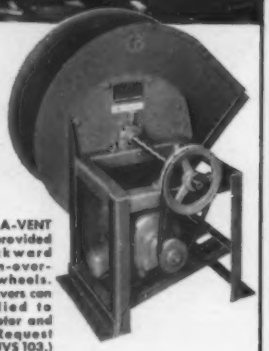

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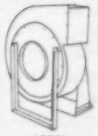

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DATA FILE

(Begins on page 206)

explains design features and gives details on suspensions and conductor systems. Clearance data, specifications included. Wright Hoist Div., American Chain & Cable Co., Inc.

397 **Electric Hoist Manual**—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load-Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys. Manning, Maxwell & Moore, Inc.

398 **Overhead Cranes**—Bulletin T202, 20 pp, gives full information on top running double girder cranes with top running trolley in capacities from 2 to 12 tons, spans to 60 ft. Data is also given on top running single girder cranes, both motor driven bridge types and head geared or push type in capacities from 1 to 10 tons, spans to 50 ft. Features which contribute to efficient operation and low maintenance costs are detailed. Several pages are devoted to electrical information. Chicago Tramrail Corp.

399 **Crane and Hoist Parts**—Bulletin G8 covers company's line of hoist grabs as well as component parts for various type cranes. Includes photos and drawings of the parts, along with descriptions and specifications. Downs Crane & Hoist Co.

400 **Manual on Electric Hoists** — Catalog H-46, 40 pp, covers monorail and stationary hoists and car pulleys. Explains fundamental types of grabs, methods of hanging I-beams, types of hoist suspension, controls. American Engineering Co.

401 **How to Choose a Crane**—Designed to aid in the selection of overhead cranes, 8-pp Unit 79 shows how to analyze handling problems, decide on the type of crane desired and draw up specifications for crane proposals. Basic data is provided on classes of crane service, crane ratings and capacities and recommended speeds for bridge, trolley and hoist, along with standard dimensions and clearances. Gives 14 safety features. Whiting Corp.

The two Reader Service Cards on pages 201-202 are easy to use and need no postage. Just circle the item number of catalogs wanted.

402 **Power and Free Conveyors** — Catalog 52, 80 pp, describes important features of a power and free conveyor system and illustrates component parts. Includes data on trolleys, rivetless chain, track and yokes, horizontal roller curves, single and compound vertical curves, switches, caterpillar drives, roller curve takeups, inspection and lubrication gates, carriers, load bars, bumpers, automatic stops and feeders, others. Dimensions and standard assemblies are shown on diagrams and typical applications pointed out. Jervis B. Webb Co.

403 **Engineered Conveyor Systems**—Catalog 853, 32 pp, illustrates conveyor systems in use in a wide range of industries, showing how they suit handling requirements involved. Roller, wheel, belt, chain, overhead trolley and elevating conveyors are included, also spirals, portable power conveyors, ball transfers and special equipment. Mathews Conveyer Co.

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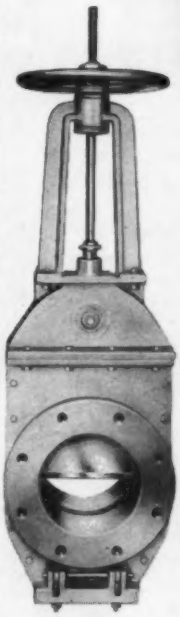

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(Begins on page 206)

404 **Conveyor and Elevator Belting Tips**—This 32-pp manual on installations, maintenance and care of conveyor and elevator belting, uses photos and drawings to show ways to improve belt service and lengthen belt life. Includes a discussion of belt design, covers, reinforcements and grades. Repair methods, splicing, and fastenings are also covered, and there's a table listing common conveyor belt maintenance problems. The B. F. Goodrich Co.

405 **Roller Conveyors**—Catalog 60A, 20-pp, contains engineering data on medium and heavy duty roller conveyors, including specifications and capacities on rollers and bearings. Heavy duty mobile unit for straight sections of roller conveyor is illustrated, also roller curves, spur sections, sliding switches, converging sections, vertical lift and horizontal gate sections in permanent and portable types. Installation views are included. The E. W. Buschman Co.

406 **Conveyor Belting** — Folder 54-3, contains a capsule description of construction, types of treated stitched canvas belting for all conveying and elevating applications. Describes company's general conveyor and elevator belt, oil- and acid-resisting belts to handle hot materials to 600 F. Imperial Belting Co.

407 **Metal Conveyor Belts** — This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belts; covers raised edge and flight constructions, chain edge construction, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

408 **Lift Truck Work Kit**—A method of predetermining the time necessary for fork lift trucks to perform specific operations is provided in this work kit, designed to enable plant engineers to apply fork lift truck standard performance data. It can assist in determining efficiency of fork lift trucks now in use as well as in planning for future needs. Includes typical materials handling examples to show technique for application of the data, as well as charts providing times for basic truck motion elements. The Yale & Towne Mfg. Co.

409 **Oil-Hydraulic Lifts** — **Catalog RE-203**, 20-pp, covers the field of heavy-duty oil-hydraulic lifting devices for industrial applications. Featured in catalog are company's standard Levelator lifts, a 6000 lb single-jack model and a 12,000 lb dual-jack lift. Also featured is an electric pump mounted on an oil tank for powering oil-hydraulic devices. Illustrates lift platforms, platform accessories and safety devices, jacks, power units. Rotary Lift Co.

410 **Fork Truck Efficiency Test**—This 8-pp article explains how to tell when fork trucks need corrective measures. Lists equipment and facilities necessary for truck testing, tells how to test traveling efficiency and hoist speed measurements, shows suggested test data forms. Mercury Mfg. Co.

411 **Handling Baskets** — Bulletin B-54 describes company's complete line of standard and custom-engineered Eezy-Stak parts handling baskets, for machinery, washing, plating. Wire & Iron Products, Inc.

412 **Platform High Lift**—Bulletin 551-3 features a walking-type battery-powered platform highlift truck, company's Model PO-40. Gives specifications and advanced features of this unit which is designed to speed moving and stacking of skids, box tops, cases, crates. Barrett-Cravens Co.

413 **Casters and Wheels**—Catalog 138 is a 191-pp product manual on company's line of casters and wheels, describing design features and listing full specifications. Photos and drawings are used profusely to illustrate data, covering furniture casters, wheels, glides, desk shoes and various accessories. Darnell Corp.

DUST CONTROL AND AIR CONDITIONING

414 **Dust Control, Blast Cleaning**—Bulletin 1210, 24 pp, fully illustrated, describes manufacturer's line of blast cleaning and dust con-

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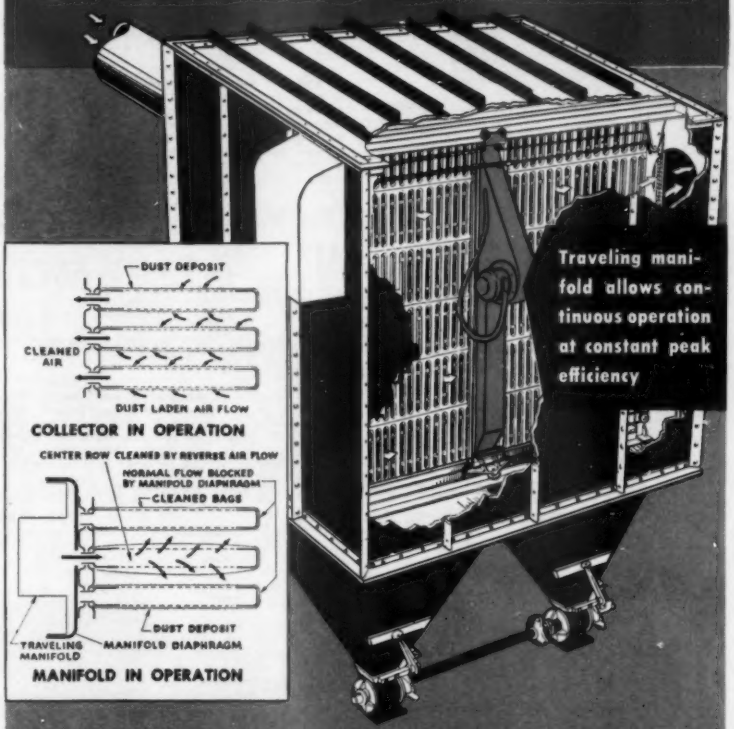

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DATA FILE

(Begins on page 206)

trol equipment, accessories. It is indexed according to equipment, type and purpose. Lists three methods of application. Pangborn Corp.

415 Dust Control—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size, distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

416 On Dust Collection—Specifications and descriptive details about companys Hydro-Filter are contained in 12-pp Bulletin 55. Tells how unit uses filtering principle to trap dust by impingement on glass spheres; entrapment on bubble surfaces and containment within water droplets. Separating efficiencies, application data, construction and design, as well as a description of models, capacity range available and description of laboratory facilities are included. National Dust Collector Corp.

417 Tubing for Many Jobs — Flexible tubing for ventilation, fume and dust removal as well as materials handling is described in 8-pp Catalog C2-4. Gives detailed information on company's Spiratube A and Spiratube R, two types of lightweight tubing made from continuous helical coils of spring wire wound with fabric. Gives uses. Flexible Tubing Corp.

418 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations shows various methods of hooding dust source. American Air Filter Co., Inc.

419 Dust Collectors — Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. Includes capacities, sizes. The Kirk & Blum Mfg. Co.

420 Dust Control Systems—Valuable engineering data on methods of dust control as well as descriptions of company's line of dust collectors are contained in illustrated Bulletin 636-2. Specifications on all models are included. A special section tells how to design your own system. Aget Mfg. Co.

421 Dust Filter—Design, application and benefits of company's AC dust filter are described in illustrated 26-pp Bulletin 559. Filter performance curves, principle of air filtration, filter comparison charts, woven vs felted filtering media are featured, along with technical data on design, capacity ratings, dimensions, velocity, air volume and pipe friction tables. Installation photos and drawings of typical equipment layouts are included. The Day Co.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 201 and 202.

422 Flexible Hose—A set of five bulletins (Nos. 40 through 44) are of interest to plant engineers concerned with the design, installation or purchase of flexible hose for dust and fume control, air conditioning and materials handling. They provide general information, data on installation, application suggestions, technical data and prices on hose, duct and accessories. The Flexaust Co.

423 How Conditioning Units Can Help—The advantages of self-contained units in cooling, dehumidifying, cleaning are cited in 40-pp Catalog 1307. Explains installation, operation. Provides data on direct expansion and cold water cooling and on hot water and steam heating. Clarage Fan Co.

424 Air Conditioning Filters—Bulletin 600, 8 pp, describes company's Staynew ventilation and air conditioning filters. Specifications, engineering, performance and installation data covering dry type panel filters for the removal of air-borne impurities given. Dollinger Corp.

425 Air Conditioners—Full information, including unit specifications, on company's redesigned line of water-cooled packaged air conditioners is given in 8-pp Form L-241. Explains and illustrates features contributing to operating economy and longer life. Discusses installation. Airtemp Div., Chrysler Corp.

ELECTRICAL

426 Variable Speed Motors—Sixteen-pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls; etc. U. S. Electrical Motors, Inc.

427 Motor Starters—Booklet 1062, 16 pp, describes motor starters having short circuit protection for 2200- to 5000-v systems. Illustrates starters using company's 50,000 kva interrupting capacity type HS contactor; also starters which will safely interrupt the circuit from a bus of unlimited capacity. Indoor and outdoor installations are pictured. The Electric Controller & Mfg. Co.

428 Polyphase Motors — Bulletin 103 provides design features of company's Loadstar polyphase motors conforming to new NEMA standards and also gives tabulated information on the changeover. Open drip-proof and totally enclosed fan cooled motors are covered. Photos show construction details. Leland Electric Co.

429 Motor Buying Guide — Bulletin GEC-1026, 28-pp, features company's standard a-c fractional and integral horsepower motors in most general use. Included are general- and definite-purpose, fractional horsepower motors, and fhp gear motors. A section on selection of integral horsepower motors covers horsepower requirements, enclosures, starting current limitations, speeds, motor types, and selec-

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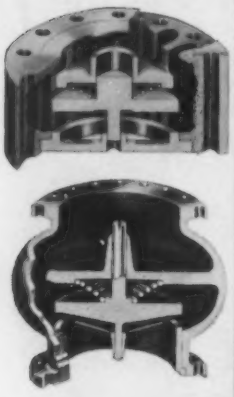

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DATA FILE

(Begins on page 206)

tion of fuses and circuit breakers. Descriptions and specifications cover single-phase, polyphase, totally enclosed fan cooled, and gear-type integral horsepower motors. Photos, ratings, dimensions, weights, frame numbers, and modifications included. General Electric Co.

430 **Enclosed Switches**—Catalog 83, 28-pp, describes in detail enclosed switches for industrial applications. Included are general switches designed for use on either a-c or d-c purpose switches, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches, all of which are available in a variety of actuator designs, contact arrangements and electrical ratings. Photos, dimensional drawings, circuit diagrams, electrical data are included. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

431 **FHP Manual Starters**—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual starters. Lists applications for them. Square D Co.

432 **Small Motor Switches**—This 14-pp booklet describes a line of toggle, rotary and pushbotton switches—popular types designed to meet requirements of manufacturing, plant maintenance. Generously illustrated, this booklet also includes complete rating tables. Cutler-Hammer, Inc.

433 **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters can be applied. Some of the diagrams incorporate more than one useful feature. Includes key to electrical symbols used. Allen-Bradley Co.

434 **Motor Controls**—In the 86-pp Controlog are cataloged a variety of motor controls including starters, control centers, contactors, relays, switches, and accessories. Fully illustrated with photos and dimensional drawings, gives application and descriptive information on each class, and includes prices and ordering data. General engineering data for estimating purposes included. The Clark Controller Co.

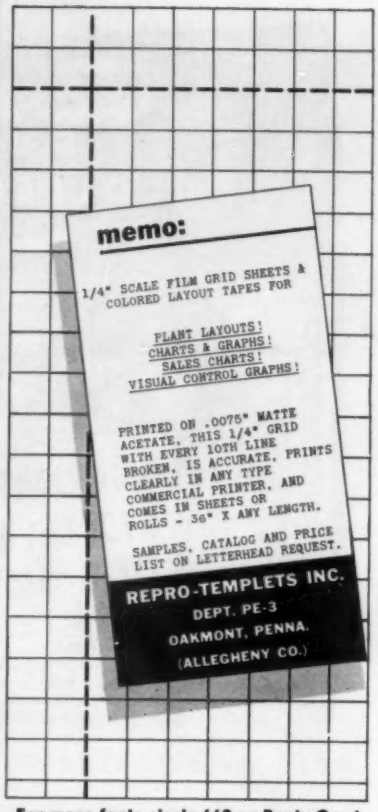
435 **Commutator Slip Ring Maintenance**—This practical little 40-pp handbook gives procedures and methods for commutator and slip ring maintenance. Generously illustrated with photos and sketches, booklet contains sections devoted to common troubles and their corrections; brushes; general maintenance; and company's products for maintenance of commutators and slip rings. Defines commutator terminology. Ideal Industries, Inc.

436 **What You Should Know About Circuit Breakers**—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

437 **Electrical Conduit**—This 8-pp bulletin, Form 646, describes company's heavy-duty, rigid steel electrical conduit, reproducing test data sheets to show how the protected conduit stands up under corrosive attacks of salt spray, sulfuric acid, caustic soda, and exposure to excessive heat. Four-color photos illustrate the effects on this and other conduit after exposure to attacks listed above. National Electric Products Corp.

438 **Trolley Busway Systems**—Three bulletins offer real help on electrical installations involving cranes and hoists, assembly and production lines, moving test lines and other moving electric equipment. Bulletin 35 (28-pp) covers 225-500 amp systems; Bulletin 40 (44-pp) 100 amp systems; Bulletin 45 (40-pp) 60 amp systems. Each includes special sections on installation planning and procedure, methods of mounting and descriptions and illustrations of equipment. Feedrail Corp.

439 **Finding Fault Grounds**—This 32-pp illustrated booklet covers use of the Allen ground detector in the detection and location of elec-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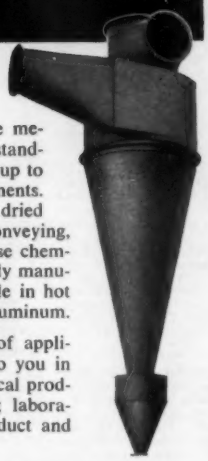

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Vise overhangs front legs so threader handles swing clear . . . Extra light, strong . . . Big vise base, pipe and conduit benders, pipe rest, tool slots, ceiling brace screw . . . efficient vise with LonGrip jaws—it's got everything!

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DATA FILE

(Begins on page 206)

trical fault grounds. Separate chapters cover grounded vs ungrounded systems, operating instructions, explanation of miareadings encountered, complete cancellation, detection of fault grounds in lead-covered underground cable, tracing buried and/or hidden elements. Excel Electric Service Co., Inc.

440 **Battery Manual**—Battery selection techniques are emphasized in 20-pp Bulletin 210, a revised edition of this manufacturer's manual on storage batteries for stand-by power, emergency lighting and switchgear applications. A discussion of charging equipment and simplified battery maintenance procedures is included. Storage battery installation procedures are described and illustrated by photos. Exide Industrial Div., The Electric Storage Battery Co.

441 **Handbook on Storage Batteries**—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

442 **Motive Power Batteries** — This 48-pp general service manual on lead acid batteries for all types of motive power application is a practical guide to industrial cycle service, including industrial truck, air conditioning, and others. Includes photos, charts, tables, methods of repair, maintenance and theory of operation, instructions covering repairs with regular or special tools, simplified testing methods including safety practices, acid handling precautions, and charging methods. C & D Batteries, Inc.

443 **Asbestos Insulation**—"Specifications for Asbestos Varnished Cambric N.E.C. Type AVA Lighting Wire and Power Cables," 8 pp, establishes performance tests for asbestos insulation applied as a felted wall in combination with varnished cambric tapes for wires and cables with 600 and 1000 v ratings. Also measures plus values of the construction over and above industry standards. Standards for test characteristics, such as minimum permissible breakdown after initial dielectric test are covered. Rockbestos Products Corp.

444 **Flexible Cords** — This well-illustrated 24-pp booklet includes all new Underwriters' classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on how to select proper cord. Whitney Blake Co.

445 **Wire-Wound Components**—Catalog R-200, a 36-pp guide to manufacturer's electronic components, describes subminiature resistors, precision and power resistors, IF and RF transformers and coils. Table and charts give specifications. I-T-E Circuit Breaker Co.

LIGHTING, COMMUNICATIONS

446 **Fluorescent Lighting**—This 24-pp fluorescent lighting guide book is a reference digest on fluorescent products. Gives advantages of this type of lighting; summarizes various lamps and parts, including starter sockets, lampholders. Includes reference chart for lamp performance when interchanged with typical ballasts. Sylvania Electric Products Inc.

447 **Guide to Luminaires** — Pocket-size, 28-pp Bulletin B-5799-BB covers fluorescent luminaires for industrial and other use. Summarizes salient features of each type of luminaire as it discusses electrical characteristics, maintenance and mounting data, details of construction, dimensions, and recommendations for application. Also contains a pictorial guide to floodlights and incandescent luminaires for industrial and other use. A 4-pp tabulation of buying data concentrates information needed for procurement. Westinghouse Electric Corp.

448 **Industrial Lighting Equipment** — Technical data on company's CFI-10 and CFI-25 industrial lighting equipment with porcelain enamel reflecting surfaces is featured in two

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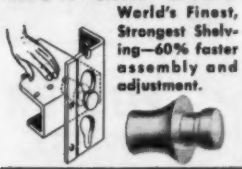

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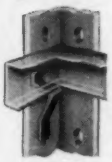

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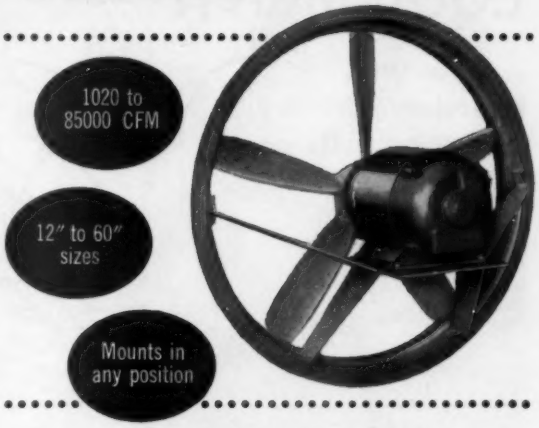

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DATA FILE

(Begins on page 206)

new illustrated bulletins. Chief design features are pointed out and dimensional data are given. Day-Brite Lighting, Inc.

449 **Lighting Unit Standards**—A complete compilation of new RLM Specifications is presented in the 48-pp 1955 edition of this authoritative booklet. Covers 46 different types and sizes of incandescent and fluorescent industrial lighting units. In addition, booklet explains reasons for the standards, discusses the basis for the specifications and the objectives of the manufacturers participating in the RLM Inspection and Certification Service. RLM Standards Institute, Inc.

450 **Plant Lighting Planning Guide**—This 32-pp handbook of industrial lighting presents economics of a plant lighting program in terms of lower production costs, reduced working time, less fatigue and eyestrain, less spoilage, fewer accidents, better morale. Explains six major steps in initiating, developing and carrying out a lighting program; tells how to select equipment and stresses importance of maintenance. Includes table of recommended levels of illumination for industrial interiors. Benjamin Electric Mfg. Co.

451 **Signal Equipment**—Tips on how to select suitable signals for any specific operation are offered in one of a series of bulletins—Nos. 100-125—bound in this 40-pp catalog. Other bulletins describe horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics and other data included. Federal Sign & Signal Corp.

452 **Sound Measurement**—Form 797-C, 12-pp, outlines the many applications of sound and vibration measuring instruments and describes several models of sound level meters designed for measuring intensity of sound and analyzing its various frequency components. Includes specifications and full descriptions of the models, along with photos of the instruments in use and data on various accessories. General Radio Co.

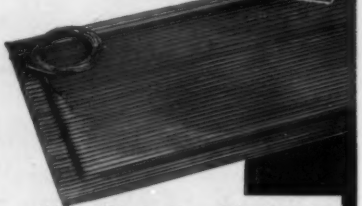
453 **Television Equipment**—Twenty basic applications for "TV Eye" low-cost closed circuit television equipment are described and pictured in Form 3R2335. Folder explains equipment's functions and operation, lists specifications. Radio Corp. of America.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

455 **Portable Electric Tools**—This 1955 Standard Catalog, Form 10, 24 pp, features company's line of portable electric tools, including electric drills, bench-drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, saw blades, vacuum cleaners, and others. Photos and full specifications included. The Black & Decker Mfg. Co.

454 **Data for the Shop**—"Fluids and Facts for Metal Working" is a pocket-size booklet

RECORA *Switchmat*



. . . thin, mat-like pressure switches that close circuits whenever pressure is applied to any point in their area; open circuits when pressure is released. Widely used as "area switches" on floors and platforms for automatic door openers, alarm systems, traffic controls etc. Used around machinery for foot switches, safety stations and emergency cut-outs. Available in any size, shape or quantity, for integral, built-in parts of mechanisms, devices and systems.

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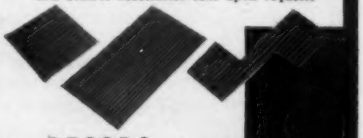
Catalog Sheet CS-21 describing Recora Switches and control accessories sent upon request.



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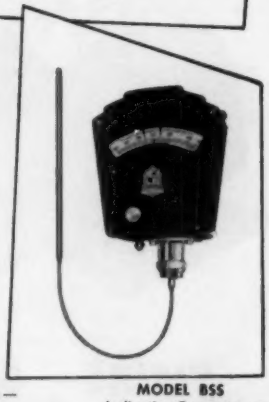

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DATA FILE

(Begins on page 206)

of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Standard Oil Co. (Ind.)

456 **Where to Use Your Stud Driver**—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of pre-drilled fixtures. Remington Arms Co., Inc.

On pages 201-202 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

457 **Pipe Tool Ordering Guide**—Catalog 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

458 **On Spot Welding**—"Spot Welding from One Side—With a Portable Gun," 12-pp, describes an inert-gas-shielded tungsten-arc spot welding process. Over 30 tables, weld cross-section and application photos, drawings and graphs are included. Sections of text cover when to consider spot welding from one side, how the equipment operates, standards and test procedures, factors affecting weld. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

PACKINGS

459 **Packings for Chemicals**—Dura Plastic Teflon packing for sealing applications in the handling of corrosive chemicals is introduced in Bulletin 461 M.D. Stresses heat resistance of the material, chemical inertness. Discusses construction details and lists packings for use with specific chemicals. Durametallic Corp.

460 **Buyer's Guide on Packing**—Twenty-pp Catalog PC-101 brings together all material on company's Palmetto packings and includes data on packing for liquid pistons on inside-packed piston pumps. Greene, Tweed & Co.

OTHER EQUIPMENT

461 **Graphitization in Piping**—"Considerations in the Evaluation of Graphitization in Piping Systems," (Reprint TR-594) is a 10-pp illustrated article. Subjects discussed include sampling procedure; bend testing, impact toughness evaluation, and metallographic evaluation; uniformity of graphitization; and heat treatment. Grinnell Co., Inc.

462 **Burners**—This 16-pp illustrated bulletin describes company's line of burners for refining, processing, heating and generating. Includes photos of units, schematic diagrams showing design and operation, and full specifications. John Zink Co.

463 **Metal Finishing Systems**—Bulletin HH-100 provides a quick view of the complete metal finishing equipment offered by this company. Shows washers, bake ovens, paint spray booths, pickling machines, sludge filter and other equipment. U. S. Hoffman Machinery Corp.

464 **Industrial Leathers**—These illustrated data sheets cover company's leather products and include belting. Also give data on leather packings for hydraulic and pneumatic equipment. J. E. Rhoads & Sons.

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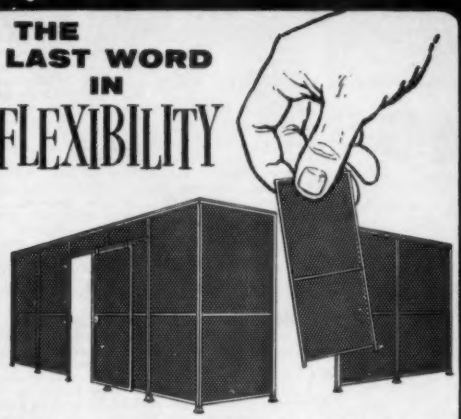

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Always dependable—whether it operates once per year or several times per minute. It remains operative at all times because dust, dirt, grease or moisture cannot contaminate the contacting elements.

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Independent outside adjustments are provided for setting both the cut-in and cut-out points.

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No guesswork or calculations are required—the pointers indicate on an accurately calibrated dial, the exact operating pressures or temperature.

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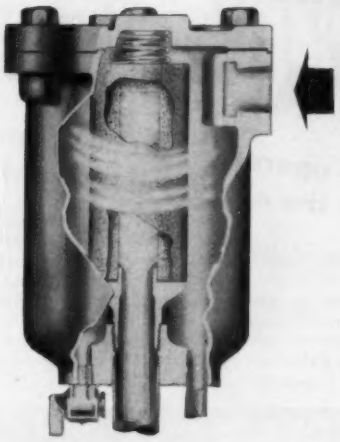

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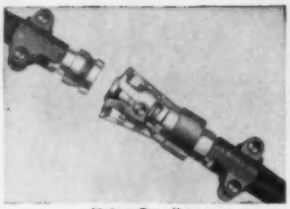
give operator complete control of the air line at any point

Operator can shut off air and change tools quickly. Newly improved design permits the coupling to be locked in either "On" or "Off and Exhaust" position. Air in tool is exhausted to atmosphere automatically, preventing accidents. Pressure tight leak-proof construction — but free swiveling to avoid kinking the hose. For any application involving line air to 250 psi.



Valve Coupling Unlocked and Disconnected

Valve Coupling Locked in "Off and Exhaust" Position

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Quick-As-Wink®

Air and Hydraulic Control Valves and Pressure Specialities

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Ask your jobber—or write for DURA HOOK Bulletin No. DHPN covering sizes and prices.

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KALAMAZOO MICHIGAN

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DATA FILE

(Begins on page 206)

465 **Steel Reservoirs, Standpipes**—This 24-pp booklet pictures installation of reservoirs of 50,000- to 10,000,000-gal capacity, having cone, umbrella or ellipsoidal roofs and ornamental structures with special architectural features. Chicago Bridge & Iron Co.

466 **Teflon Products**—Three bulletins present this company's Teflon packings, gaskets, special parts and stock. Bulletin CP552 describes Chempro lines of Teflon ring packing, Teflon impregnated asbestos packing, V-type packing, and Teflon seal cage—for use with acids and strong chemicals. Bulletin CP553 covers Teflon jacket gaskets, solid ring gaskets, expansion joints and special gaskets. Bulletin CP554 illustrates special parts. Chemical & Power Products, Inc.

467 **Aftercoolers, Separators**—Bulletin 711, 12-pp, describes cyclone separators and pipe line aftercoolers for compressed air systems. Prepared to aid plant engineers, in taking a realistic cost accounting of their compressed air systems, it offers suggestions as to the scope of such an accounting and a check list for analyzing the efficiency of the job being done by aftercoolers now in use. Also provides a chart covering moisture content of air under pressure at various system temperatures. Illustrates and describes aftercoolers, separators and air filters. R. P. Adams Co., Inc.

468 **Nylon For Maintenance**—Nylon as a maintenance material for mechanical, chemical and electrical applications is described in this illustrated folder. Advantages are given, and specific uses listed along with a lineup of material's maintenance properties. Stock shapes and sizes are shown and finished parts illustrated. Tips on machining are offered. The Polymer Corp. of Pennsylvania.

469 **Large Capacity Condenser**—Bulletin 123 describes the 400-ton capacity Aeropass condenser and fluid cooler. Explains and illustrates operating principles of the unit. Lists benefits offered for large liquid cooling and condensing applications. Niagara Blower Co.

470 **Production Control System, Procedures**—Publication X-1268, 56 pp, details a method of material control intended to result in a shorter planning cycle while speeding production by eliminating causes of delay on the production lines. Illustrated with typical forms and charts, book outlines procedures for engineering, production planning and progress, machine load, material and tool procurement and control. Remington Rand Inc.

471 **Handbook on Demineralizing**—Comprehensive 40-pp Bulletin 5800-B compares various methods of water treatment, indicating the comparison between demineralizers and evaporators. It discusses the characteristics of the various types of available cation and anion exchange materials and offers data on operating costs of demineralizing. It tells when to use 2-bed, 3-bed, 4-bed, mixed or mono-bed demineralizers. It also indicates when decarbonators or vacuum deaerators are required. The bulletin is replete with typical flow diagrams, photos of installations. Cochrane Corp.

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Free Manual

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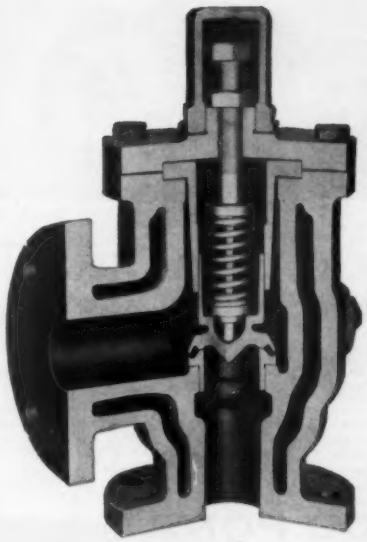
Jacketed

RELIEF VALVES



Designed especially for heavy viscous products such as asphalt, waxes, plastics, heavy oils and pitches, this valve is fully jacketed for maximum heating efficiency. The disc is of top guided design, removing all flow interferences inherent in bottom guided types. Gasketed cap covering adjusting screw provides zero leakage.

Valve seats may be removed or repaired without removing valve from line.

Standard valves in stock are semi-steel with iron trim in 2" x 3" and 3" x 4" sizes rated @ 450°F or 150# steam maximum jacket pressure. Set pressures range from 5–125#.

Steel and stainless steel bodies and trim, Teflon faced disc available on order.

— *Write for dimension sheet and prices.*

Parks-Cramer Company
PROCESS-HEATING DEPARTMENT
FITCHBURG 4, MASSACHUSETTS

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DATA FILE

(Begins on page 206)

472 L.P. Gas Fuels—Factors essential to efficient utilization of L.P. gas fuels are discussed in this 20-pp illustrated bulletin. These include responsibility factor, know-how factor, supply factor, quality factor, application factor, construction factor, and continuing service factor. Industrial Div., Skelly Oil Co.

473 Insect Control — Featuring manufacturer's insecticides and insect control equipment, this practical 36-pp booklet provides excellent tips on the control of industrial insects. More than 60 pests are pictured along with specific information on where they are found, identifying features, extent of damage, life stages and cycles, characteristics of existence, and recommended control measures. Ten insecticides are discussed in detail. Atomizers, mistorizers and fogging units are pictured and described as to advantages and applications. West Disinfecting Co.

474 Magnetic Selection Guide — Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets, serves as handy guide to selection. Dings Magnetic Separator Co.

475 Neoprene Design Book—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Elastomers Div., E. I. du Pont de Nemours & Co.

476 Powder Metallurgy—Manual E-55 is a 52-pp treatise on powder metallurgy, liberally illustrated with photos, tables, charts and graphs. Additional illustrative material is presented in case histories. Separate sections are devoted to bearings, component parts, and filters. Also covered are design, loads, and speeds, installation, press fit, close-in, shaft clearance, wall thickness, tolerances, temperature change, lubrications, machining, magnetic properties, flow rates. Physical properties of ferrous and non-ferrous metal powder materials are compared. Chrysler Corp.

477 Filters, Strainers — Industrial Catalog 1054, 48 pp, provides application and engineering information on company's line of microfilters and precision strainers. Fuel filters, full flow and by-pass lube filters, air separators, and metal edge strainers for fuel lube and industrial use are presented along with construction details, performance data, and specifications. Purolator Products, Inc.

478 Improved Heat Insulation — This 8-pp bulletin describes Super-Light 85% Magnesia for temperatures to 600 F, available in cement blocks, pipe sections. Twelve advantages of this lightweight insulation are detailed. Recommended thickness, physical characteristics, prices are given. Also included is information on combination coverings with Tempchek inner layer for temperatures from 550 to 1500 F. The Philip Carey Mfg. Co.

The two Reader Service Cards on pages 201-202 are easy to use and need no postage. Just circle the item number of catalogs wanted.

479 Preheating Combustion Air—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels. Air Preheater Corp.

480 Ductile Iron—Cast iron that can be bent is described in this 28-pp revised edition, with tables, charts and photos. Photos show applications of ductile iron castings, and bulletin lists typical applications in various industrial fields. The International Nickel Co., Inc.

481 For Lining Vessels — Bulletin 1012 gives details on a formula for lining steel vessels on the job and greatly extending their service life. Tells how to prepare and apply this inexpensive lining, includes data on coverage. Pocono Fabricators, Inc., Div., The Pattersen-Kelley Co., Inc.

482 Filter Fabric Facts—This 16-pp illustrated booklet contains information about filtration principles; filtering devices; filter media; textile fabrics for filtration; a comprehensive chart on chemical and heat resistance of cotton and synthetic fabrics; sections on yarns, fabrics construction and finishing; and a round-up of filter fabrics in use. Photos illustrate variety of filter fabrics being produced for industrial use. Wellington Sears Co.

483 Humidification for Profit—Bulletin 500, 16 pp, includes physical data and prices on electrically controlled and air operated humidifiers. Handbook section explains how relative humidity affects hygroscopic materials, static electricity, health and comfort. Photos show installations and several pages are devoted to selection and installation tips. Many helpful tables included. Armstrong Machine Works.

484 Finishing Systems—Illustrated Catalog A-653, 12 pp, describes complete finishing systems for porcelain and synthetic enamel, lacquer, paint, and other finishing. Also covers a variety of other industrial equipment including ovens, dust collectors. The R. C. Mahon Co.

485 Felt, Felt Products—This 24-pp technical design book describes hundreds of uses of felt, with emphasis on mechanical applications. Explains and illustrates how felts are used for their friction qualities, for cushioning, for filtering, for insulating, for sealing, for spacing, and as wicking. Gives design properties of felt and discusses 10 reasons for its importance to industry. Also tells how to select the proper felt. The Felters Co.

486 Machines for Special Products — This 12-pp catalog lists company's machine tools and other metal fabricating, forming, treating and processing equipment which is now available for contact manufacturing. Types, quantities and operational dimensions of the facilities are included. The Jeffrey Mfg. Co.

487 Steel Floor Plate—Skid resistance and other advantages of multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, weights, data on allowable loads. Typical uses of the floor plate are pictured. United States Steel Corp.

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Please send complete resume, including details of education and experience, to:

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Electrical Engineer

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You *don't* change seats in Dunham Radiator Traps for the simple reason that they don't wear out. Here's why—

Dunham's flat valve disc closes *flush against* the seat. Since the disc does not fit *into* the seat . . . isn't tapered or conical . . . there's little chance for erosion, wire drawing or excessive wear.

In addition, Dunham Traps always assure easy passage of air, water and foreign matter. *No clogging.* Extra large, nonclogging seat opening is unrestricted by any guide. No bellows to stick, no field adjustments to make.

For full information about the complete line of Dunham Specialties: WRITE FOR BULLETIN PE-3

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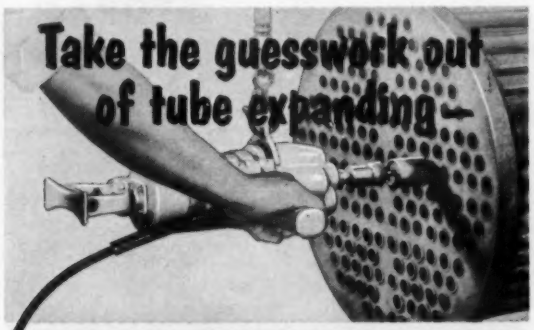
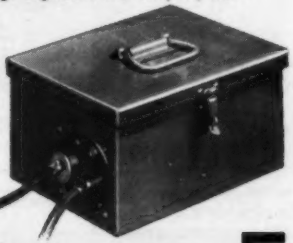


ELLIOTT ELECTRIC CONTROL

Get tight, uniform tube joints everytime with the new Elliott Electric Control. It's a torque-limiting device that automatically balances outside voltage variables without the need of a separate voltage regulator. The compact, steel-case-protected Elliott Control can be used with any standard tapping motor. Get full details in Bulletin Y-40. Write Elliott Company, Lagonda Division, Springfield, Ohio.



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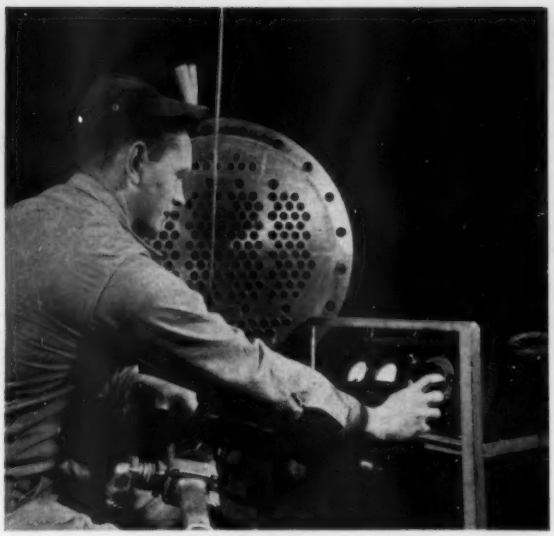

HOW ELECTRONICS MAKES P-K EXCHANGERS BETTER THAN EVER

This man is expanding tube ends into the tube sheet—the "inner face" of a shell and tube heat exchanger that holds each tube in place. By doing it electronically, with the equipment you see here, the circumference of each tube is joined to the face of the exchanger with exactly the same pressure.

This minimizes the possibility of leaks developing—even when a mile of tubing and hundreds of tube ends are involved, as they are in many of P-K's special exchangers.

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(Begins on page 206)

488 **Fire Hose Reels** — Sixteen-pp Catalog H-511-F describes hose reels for fire fighting equipment, with illustrations of various models and cutaway view showing component features. Specifications, as well as descriptions of operational advantages are included. Clifford B. Hannay & Son, Inc.

489 **Railroad Car Spotter**—Book 2092 describes a car spotter with which one man can easily spot six loaded railroad cars at one time —or handle scores of other tasks involving horizontal haulage in either direction or around corners. This spotter consists of a vertical capstan, helical and worm gear drive, housing and integral motor. Engineering information, instructions for calculating rope pulls and typical layouts for both car spotters and car pullers are provided. Link-Belt Co.

490 **High Temperature Thread Compound**—The advantages of company's thread compound for use in high temperatures are outlined in this informative pamphlet. Lists chemical properties, describes application and function, and offers comparison data on performance of compound. Felt Products Mfg. Co.

491 **Fighting Corrosion With Corrosion** — Cathodic protection against rust and corrosion is the subject discussed in this illustrated 10-pp bulletin. Describes the corrosion battery, corrective measures, cathodic protection battery, and includes design and application data. Electro Rust-Proofing Corp.

492 **Precision in Packaging** — The advantages of automatic machine packaging are outlined in this illustrated 24-pp bulletin. Describes various packaging and sealing machines, indicates kinds of packaging machinery now being produced. Illustrates various folding carton styles. Robert Gair Co., Inc.

493 **Hot-Dip Galvanizing**—How hot-dip galvanizing is prolonging life of industrial equipment is stressed in this 16-pp booklet. Photos, showing galvanized equipment in use accompany brief text explaining how this process of covering iron and steel with a protective coating of zinc serves to prevent rust. The galvanizing procedure is explained and illustrated. Coating comparison charts show how hot-dip galvanizing compares with other types of coatings as to rust resistance, dimension limits, shock resistance. American Hot-Dip Galvanizers Assn., Inc.

494 **Self-Locking Nuts** — This folder describes Flexloc self-locking nuts; shows how the locking action of the one-piece all-metal nut can be used either as locknut or stop nut. Applications of the nut are illustrated in small drawings. Standard Pressed Steel Co.

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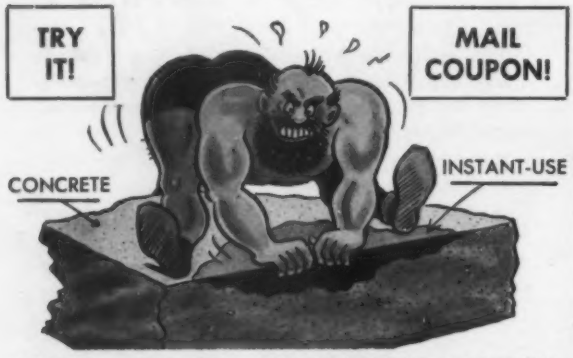

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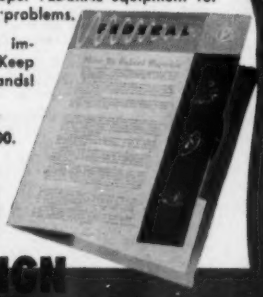

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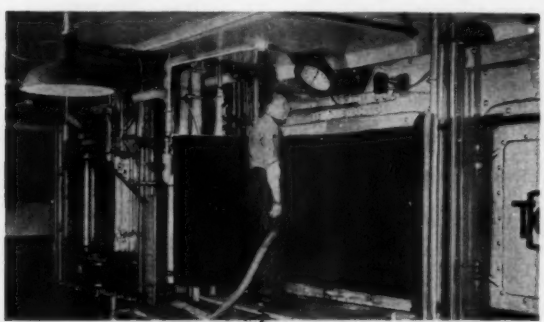

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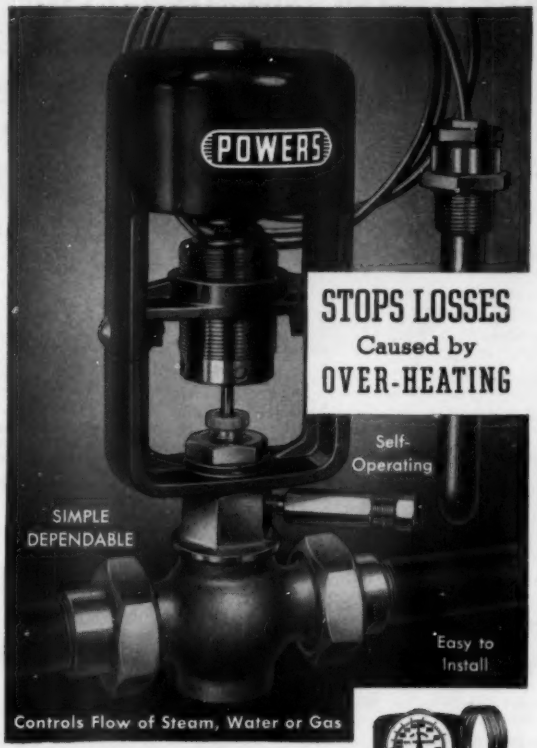

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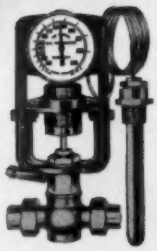

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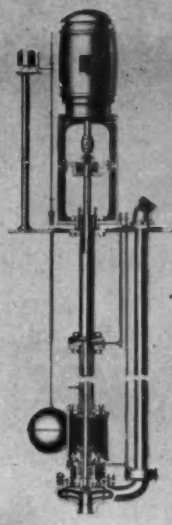

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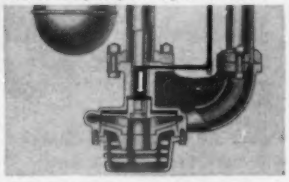

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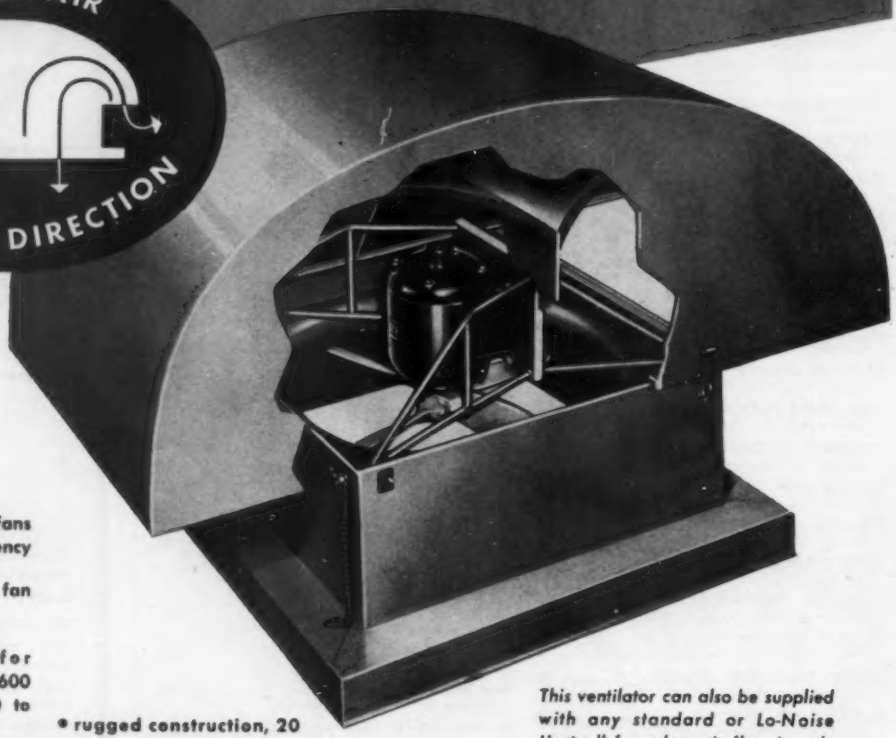
New HARTZELL REVERSIBLE ROOF VENTILATOR

MOVES AIR IN EITHER DIRECTION



- does the work of two fans with no loss of efficiency
- 28", 36" and 44" fan diameters
- capacity range: for exhaust—6800 to 23,600 CFM; for intake—6520 to 22,300 CFM
- meets the most stringent requirements for a black-out type roof ventilator
- available in curb, peak or slope base construction
- rugged construction, 20 gauge galvanized steel (18 gauge base on 36" and 44" models)
- head swings back on hinges to provide easy access for motor maintenance

This ventilator can also be supplied with any standard or Lo-Noise Hartzell fan when air flow in only one direction is required.

Please send me a copy of Bulletin A-112-A giving complete specifications and dimensions on the new Hartzell Reversible Roof Ventilator.

Name _____

Title _____

Company _____

Street _____

City & State _____

HARTZELL propeller fan co.
Div. of Castle Hills Corp.
101 Herrman Ave., Piqua, Ohio
ENGINEERING OFFICES IN PRINCIPAL CITIES

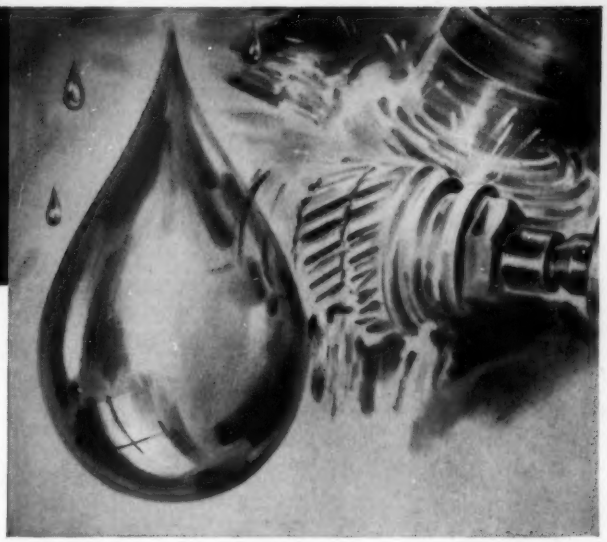
HARTZELL

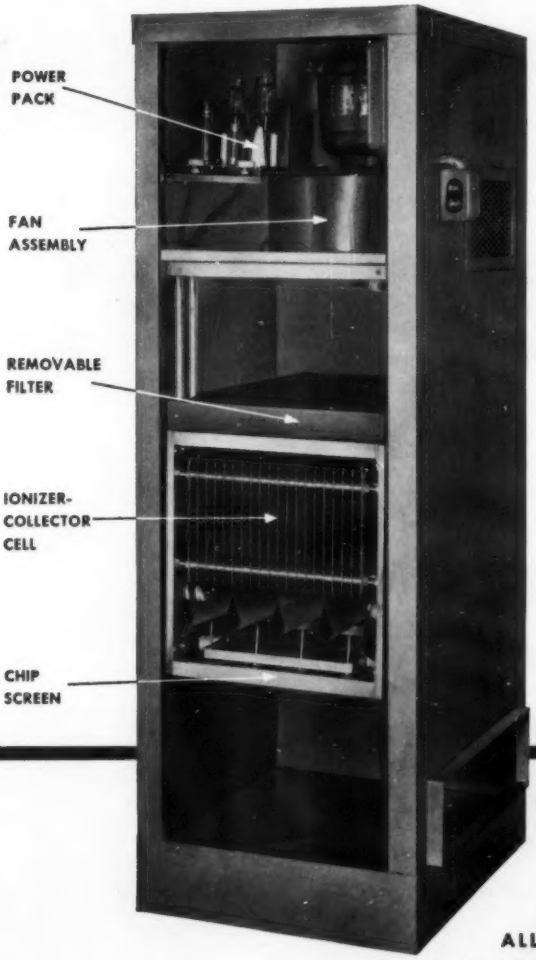
PROPELLER FANS • BLOWERS • ROOF VENTILATORS • UNIT HEATERS

For more facts circle 700 on Reply Card

Electro-Staynew Mist Collector

eliminates oil mist and smoke at the source . . .





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CLEANS AIR ELECTRONICALLY

Electro-Staynew Mist Collectors are specifically designed to be mounted on or near high speed machine tools. These Dollinger-engineered, electrostatic filters draw contaminated air from around grinding or cutting operations, *remove* over 90% of the oil mist and smoke, and then return clean air to the shop. Look at these exclusive advantages:

- **UNIT CONSTRUCTION**—Ionizing and collector cells are combined into one unit; thus only one unit to service.
- **EASE OF INSTALLATION**—needs only electrical and duct connections.
- **DEMOUNTABLE COMPONENTS**—all components can be removed easily without tools.
- **ADVANCED SAFETY FEATURES**—assure complete protection of personnel.
- **MINIMUM MAINTENANCE**—designed to be practically self-cleaning.

For complete information, write today for Bulletin 420.

DOLLINGER MIST COLLECTOR ELECTRO-STAYNEW

DOLLINGER

CORPORATION • 55 Centre Pk., Rochester, N. Y.

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

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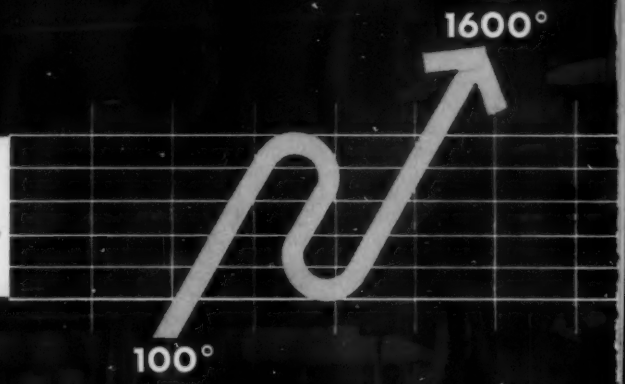
For this WIDE temperature range



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Send ALLTEMP Folder of specifications and installation details.
☐ Have your Industrial Sales Engineer call.

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APRIL, 1956

Plant Engineering

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The magazine that helps plant engineers with their everyday problems